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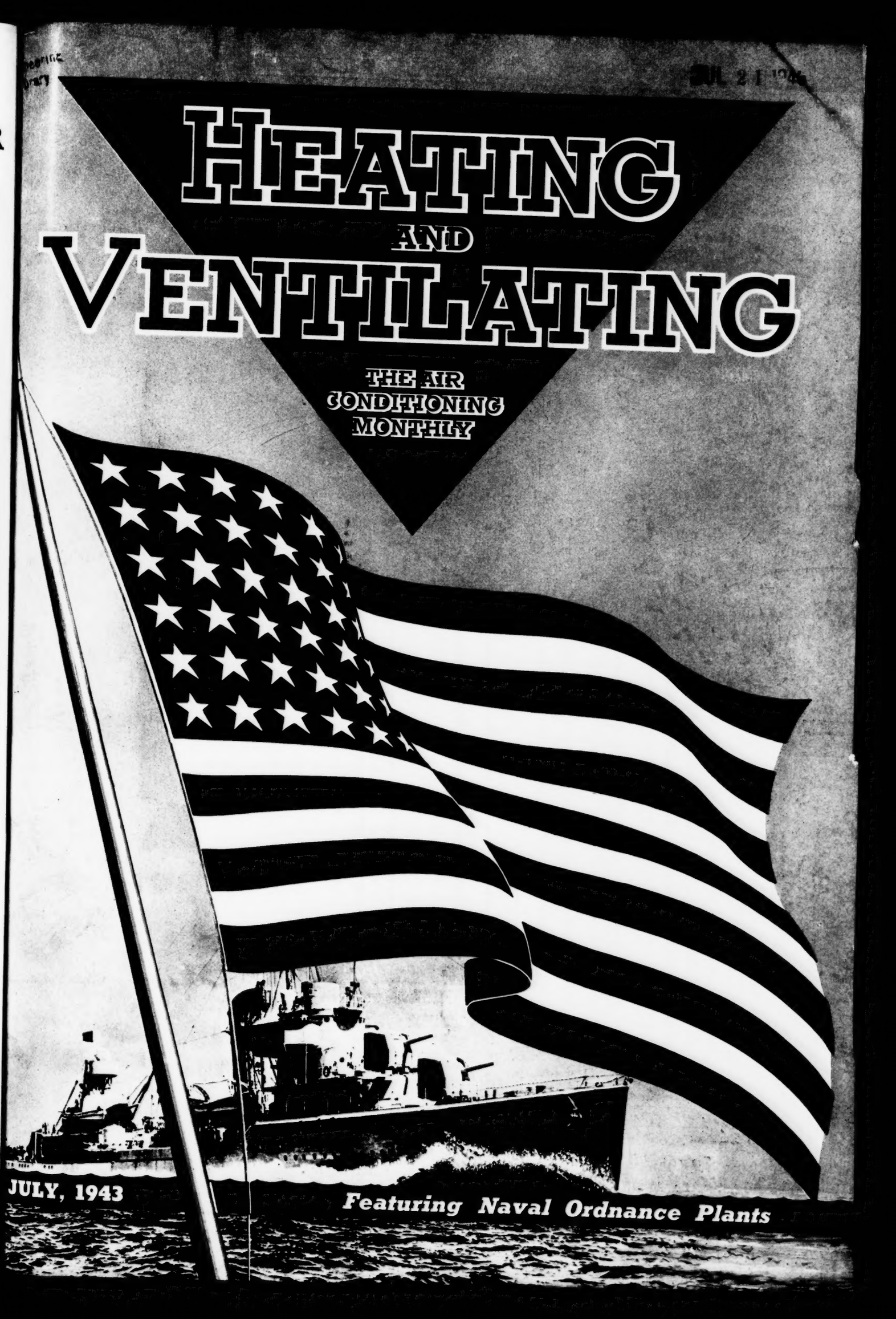
HEATING AND VENTILATING

THE AIR CONDITIONING MONTHLY



JULY, 1943

Featuring Naval Ordnance Plants

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engineers and contractors controlling the design, specification, installation and maintenance of heating, ventilating and air conditioning.

HEATING AND VENTILATING

The Air Conditioning Monthly

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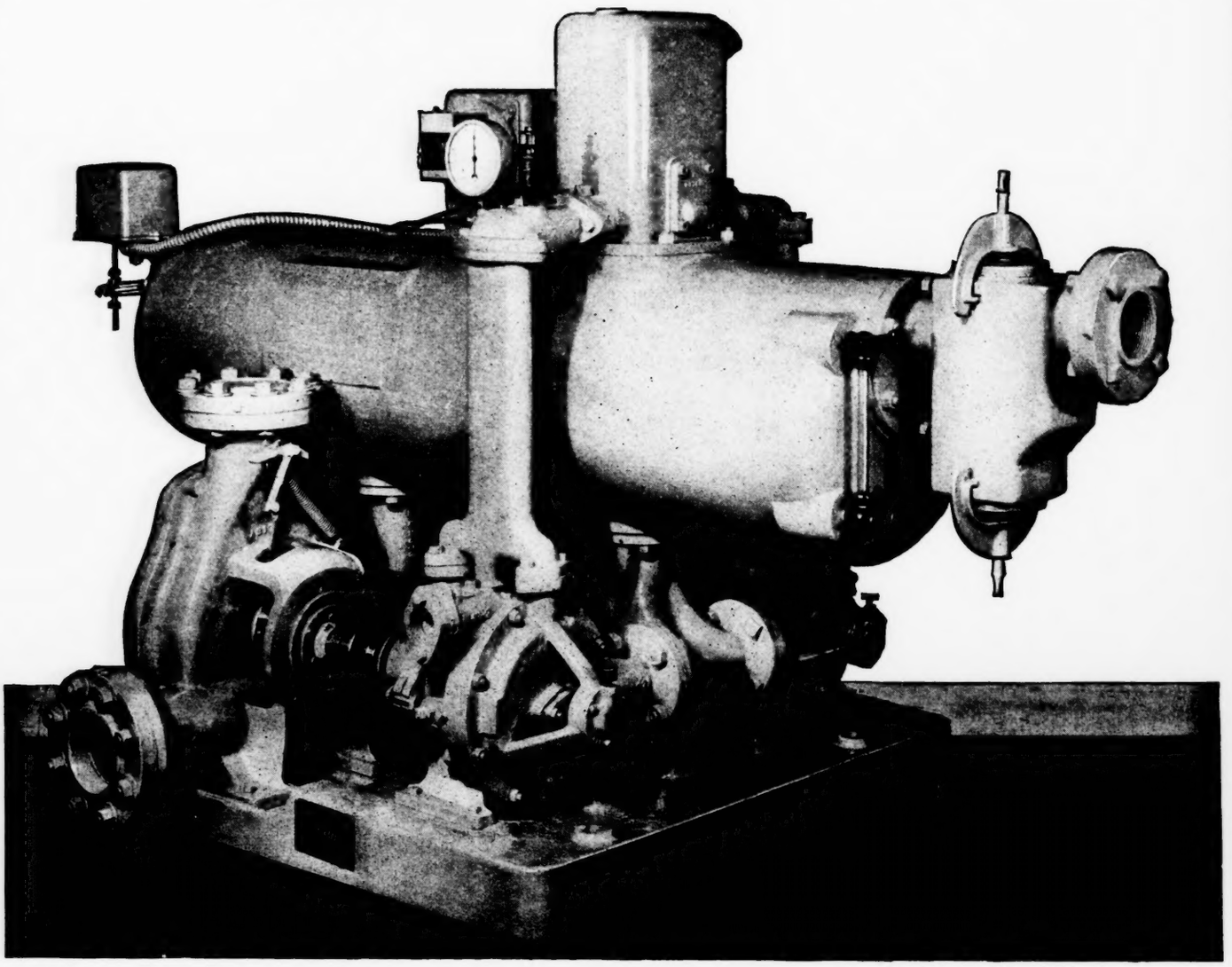

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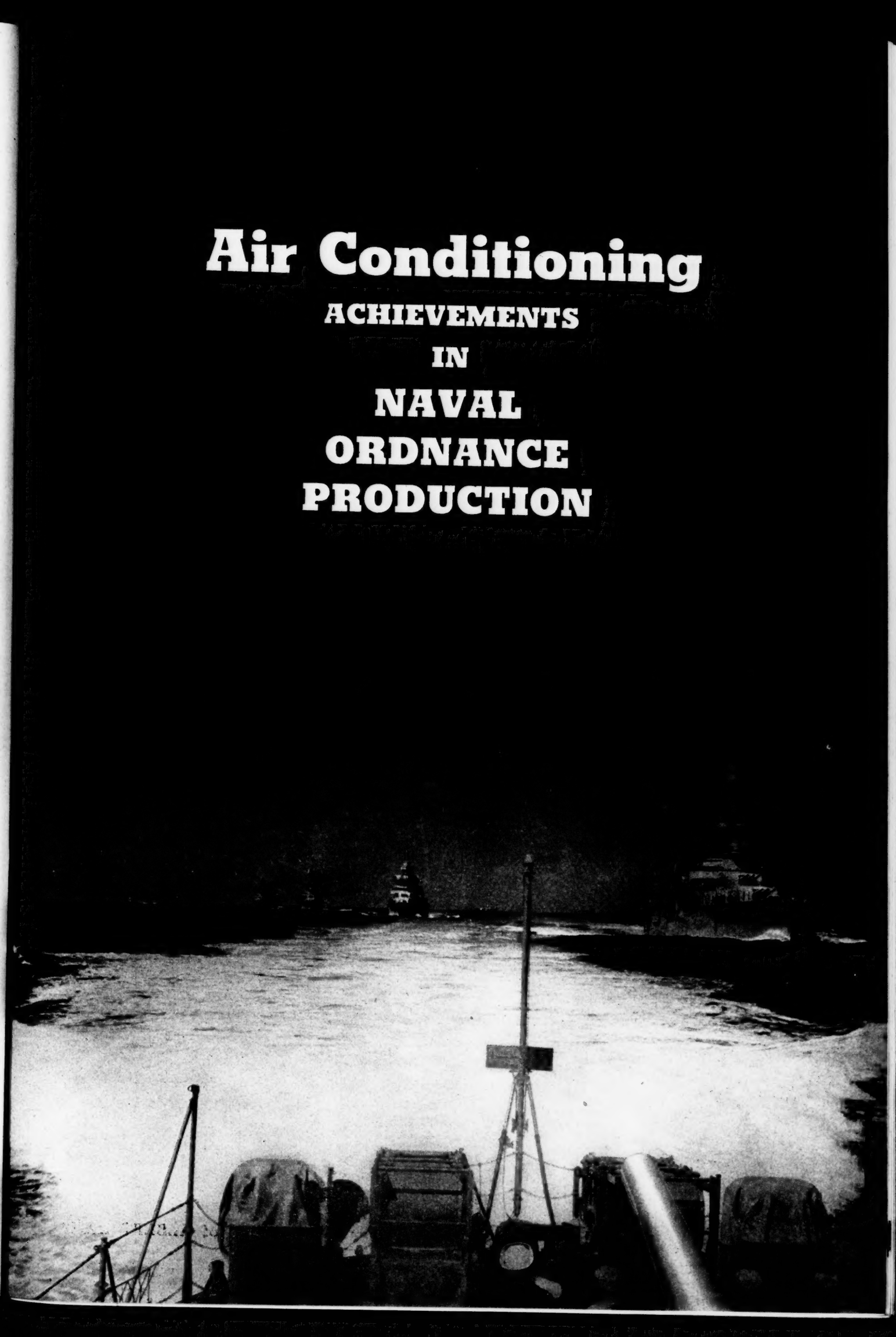
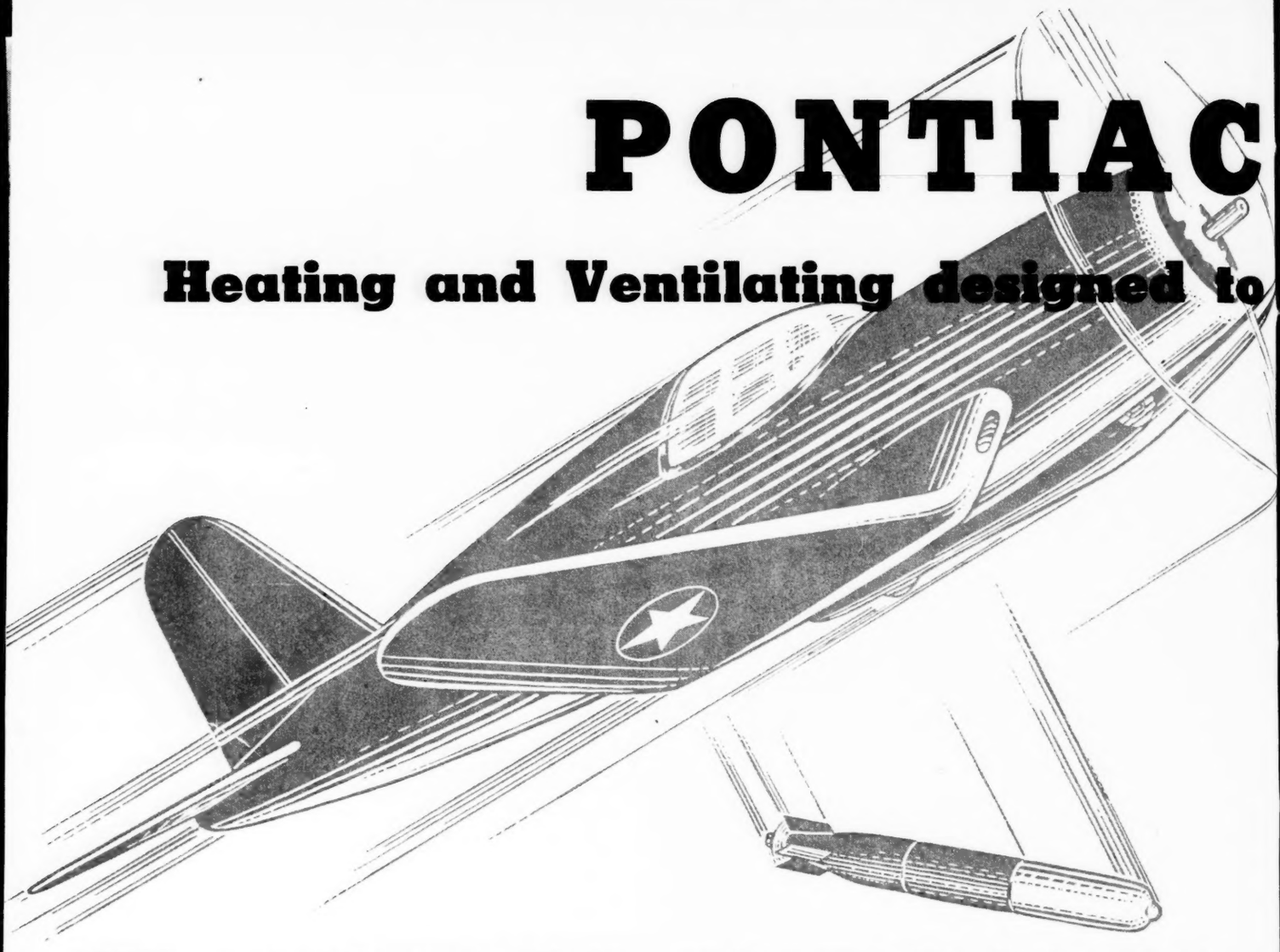
Air Conditioning

ACHIEVEMENTS IN NAVAL ORDNANCE PRODUCTION



PONTIAC

Heating and Ventilating designed to



THE construction of the new gun plant of Pontiac Division of General Motors Corporation at Pontiac, Michigan, which was begun at a time when structural materials were suddenly being diverted for the purpose of producing war materials, offers a good example of the strange conditions which the industry has had to overcome during recent months in order to provide adequate facilities for the program of production which was then reaching vast proportions.

Design Considerations

After considerable deliberation among all of the parties concerned, including representatives of the Government, and after a careful survey of available materials of all kinds that would be at all suitable for such a project, the decision was reached that by using considerable ingenuity, a satisfactory building could be designed around such stock materials as were available. In other words, the designers were not permitted to draw their plans and then order materials to meet their requirements; instead they were furnished a list of materials known to be in stock at the time and told, in effect, that if they could design a suitable building to use these materials, the materials would be released for the purpose.

Taking into consideration the purpose for which the building was intended and the equipment required, together with the immediate need for such a building, it was decided to accept this proposition and the order was given to proceed at once to design the building and the necessary facilities, including a heating system to fit in with the building structure.

Full advantage was taken of existing conditions and notable economies were effected, while at the same

Air Conditioning Achievements In NAVAL ORDNANCE PRODUCTION

GUN PLANT

utilize materials known to be in stock. Plant, of semi-blackout type, produces aerial torpedoes.

time a plant that served the purpose quite satisfactorily was designed.

One of these conditions pertained to the site. This is on a hillside, so in making the layout, the designers took advantage of the lower area to put in a basement which serves as the main employee entrance and also houses all toilets and locker rooms, a kitchen, cafeteria, and utilities. Thus the main floor was left entirely open for manufacturing purposes.

A railroad runs along the foot of the embankment. An electric crane operating above the railroad track unloads the incoming materials and sets them off on the receiving dock on the ground floor level. Materials brought in by truck are also received in the basement and are taken to the ground-floor manufacturing area by means of a freight elevator. The shipping room is on the ground floor level where the guns and parts are manufactured.

Semi-Blackout Construction

The building itself is designed for the most efficient layout for producing anti-dive bomber, rapid fire, 20 mm Oerlikon guns and aircraft torpedoes for the U. S. Navy. Of brick, concrete and steel construction, with continuous steel sash, it is of the semi-blackout type and can be quickly converted, if necessary. The flat cement roof is covered with composition roofing materials and the cement floor is paved with wooden blocks treated with creosote.

The building has a total floor area of 307,000 sq ft exclusive of the basement, with the work area divided into 40-ft bays. This provides abundant clear working space.

As soon as the first section of the building was completed, an area 640 x 120 ft, together with a basement section 180 x 80 ft, were rushed into production. It has been said that the owner started moving machines into this section early one morning and that the afternoon shifts coming on at 3 p.m. began making guns the same day. Incidentally, this section was completed 18 days ahead of schedule. The contract for aircraft torpedoes for the Navy was received later and approximately two-thirds of the plant is now being devoted to manufacturing such equipment.

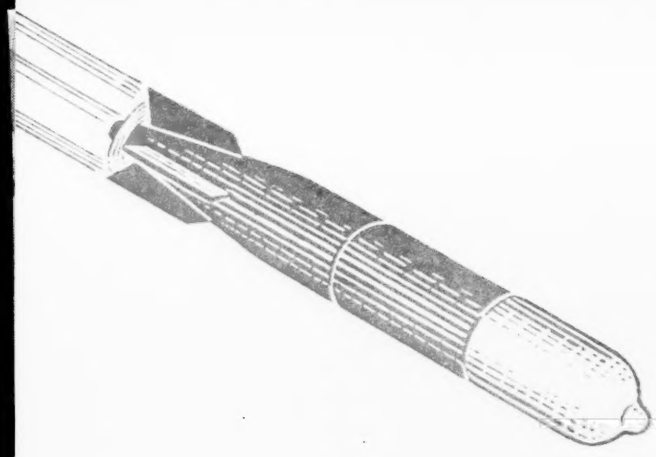
Heating and Ventilation

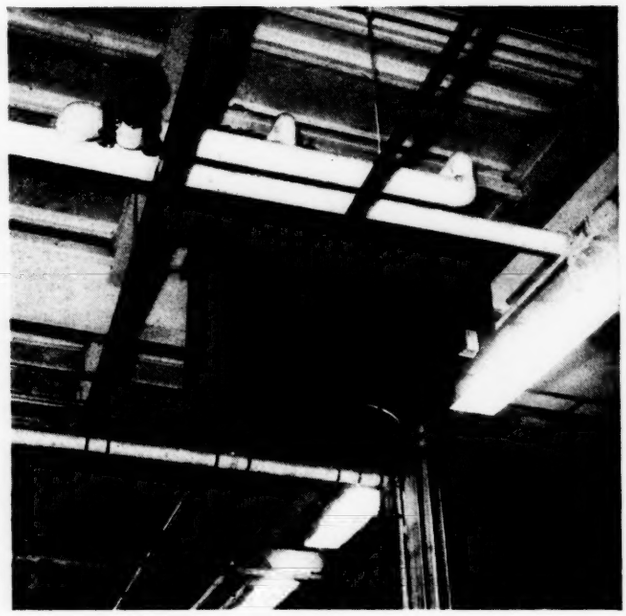
As to heating and ventilating, the first requirement was that a minimum clear working height of 13 ft 6 in. above the floor be maintained. The height from the floor to the low point of the beams was 18 ft. This gave a space of approximately 4 ft 6 in. in which to install all the service piping, heating, plumbing, unit heaters, bus ducts, fluorescent lights, and sprinkler piping with heads. The problem of piping cross-overs and the placing of unit heaters and ventilators became rather intricate with such a limited amount of room in which to work.

The use of unit heaters of the vertical type was

By G. S. WHITTAKER
Mechanical Engineer, Albert Kahn
Associated Architects and Engineers, Inc.

A registered engineer in Michigan, Mr. Whittaker has been with the Kahn organization since 1922 and in active charge of all heating design since 1931. He designed the heating for such projects as the Ford Bomber Plant, the Dodge Plant in Chicago, the Chrysler Tank Arsenal, buildings for Wright Aeronautical Corporation, Pratt & Whitney plants, numerous hospitals in the Midwest, buildings for Glenn L. Martin Co., Cadillac, American Steel Foundries, Chevrolet, and others.





Heated fresh air is diffused into the factory area by this blackout type of ventilating unit. Piping arrangement, steam trap, and the thermostats are shown.

decided upon as the simplest and most economical method of heating the plant. A system of roof ventilators was selected to take care of the ventilation requirements, and when arranged in a suitable pattern, an effective and efficient heating and ventilating system was under way.

With unit heaters of the vertical type it is possible to deliver the heat at a definite point and to cover the area intended without objectionable drafts to the workers below at their machines. These units all have diffusers of the proper type and size to diffuse air properly, and the outlets have adjustments to cover more or less area as required. This type of heater and outlets also tends to break up the natural air stratification which is one of the most serious problems confronting the heating engineer in designing heating systems for large one-story buildings.

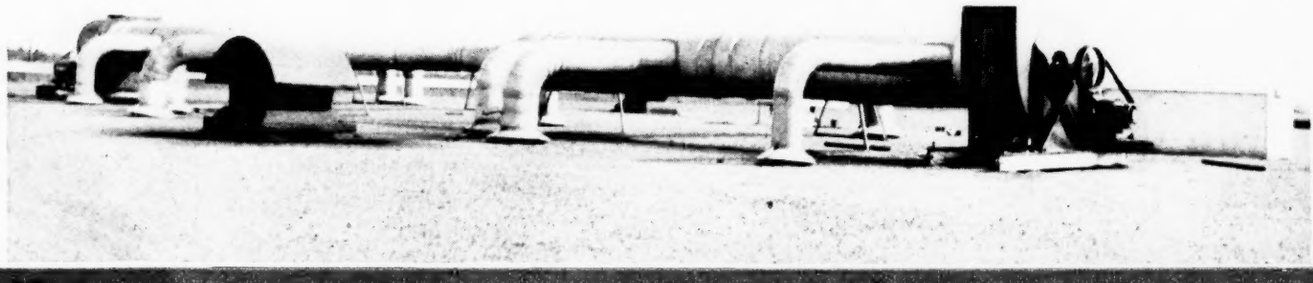
The shipping area, truck wells and large doors are all heated or blanketed by large blower-type unit heaters which cover these areas very well. The heaters at the doors are controlled by door switches and thermostats. The door switches turn on the heaters whenever the doors are opened, and when the doors are shut and the switch closed the heater still remains running if the thermostat is not satisfied.

Summer Ventilation

Since the building is almost square, with a flat roof and only windows in the side walls, there was quite a ventilating problem, particularly in the summer. With this idea in view, a total of 54 motor-operated roof exhaust ventilators having a capacity of 10,000 cfm each, were installed, complete with push button starters and motor-operated shut-off dampers. The damper motors are electrically inter-connected with the fan motor, the dampers being open only when the fan is running. The ventilating units give a total of 10 air changes per hour over the entire building when they are all in operation together. When these units are operating, the sidewall sash is opened for easy inflow of air to allow the exhaust fans to handle their full capacity and create a real air movement through the plant.

For winter operation one complete air change per hour is ample to keep the air fresh enough for excellent working conditions. With this in mind, six

Exhaust system on the roof for exhausting waste gases from furnaces in the heat treating department.

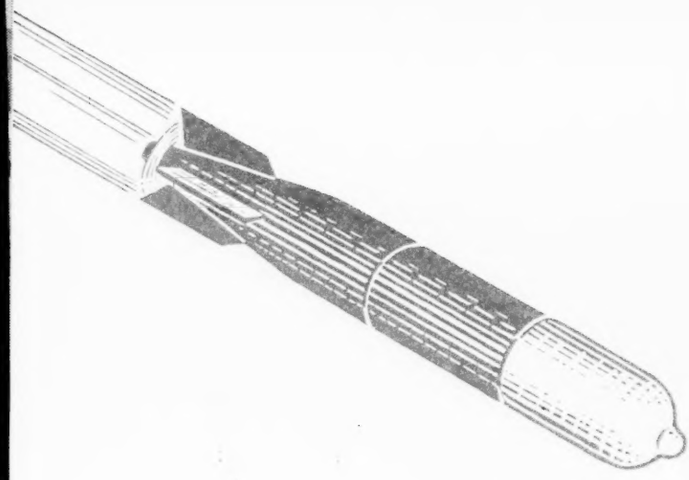


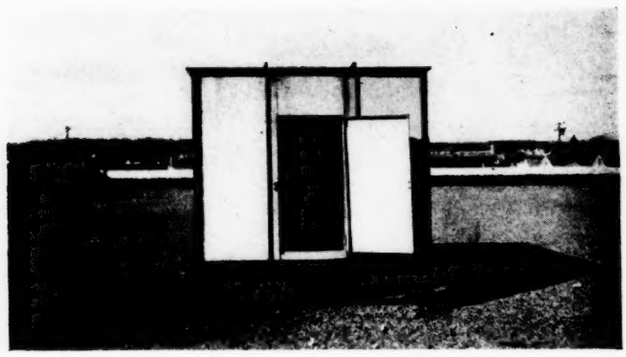
(Left) Filtered outside air is heated in this overhead blower unit and forced into the room in the background where the assembly of delicate ordnance parts requires close temperature control. (Right) A portion of the offices, showing the arrangement of projection-type unit heaters with thermostats on the wall nearby.

winter supply units were installed on the roof, complete with intake hood, non-freeze coils, fan and by-pass dampers, shut-off dampers, starters, thermostats, and adjustable outlets. The fans run continuously when the starter is in the *on* position, and the thermostat controls the face and by-pass dampers to control the air temperature. Incidentally, each of these units has a coil capacity sufficient to heat 10,000 cfm of air from 10F to 80F, which is 10F higher than the room temperature.

The basement area, which is devoted principally to locker rooms, kitchen and lunch room, is heated by large blower-type heaters, with outside air connections and controls similar to the winter supply units on the first floor. However, these units also have recirculating dampers which can be used when-

(Left) Uniform, closely controlled temperatures are required in this room where highly important parts of ordnance equipment are assembled. The duct system supplying the air is shown along the wall. (Right) A blast of warm air from the triple-outlet unit heater under the balcony provides a seal against the in-rush of cold air when the loading track doors are opened.





Clean air for the conditioned sub-assembly room is taken in through this filter house on the roof. Note building ventilator hoods on left.

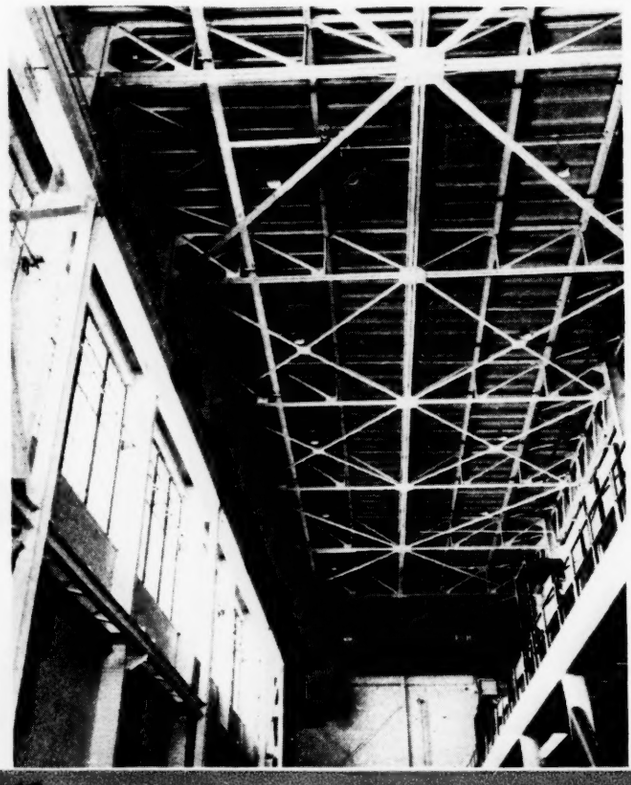
ever the units are to be used for heating only, such during plant shut-down periods when outside air would not be needed. For exhausting the air from this area there are disc-type propeller fans of sufficient capacity installed in the windows to balance the air supply.

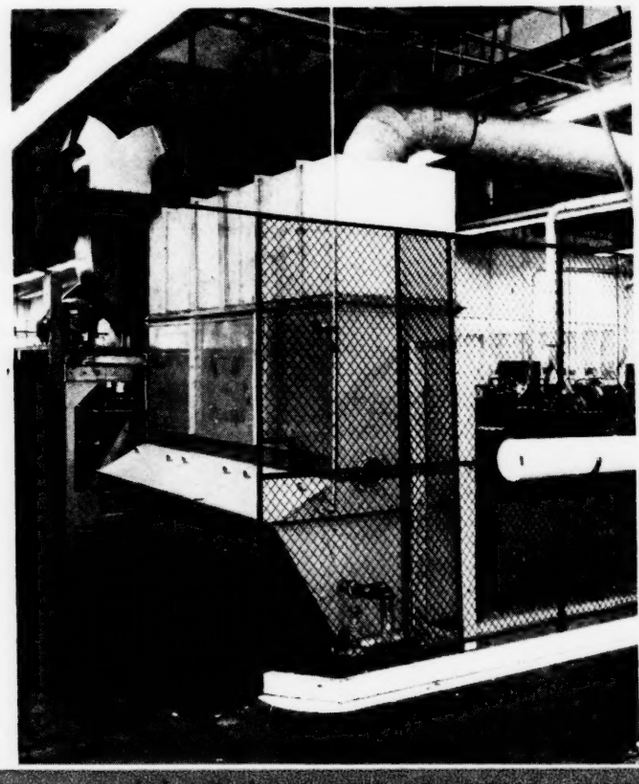
There is a small office section along one side of the plant which is heated by cast iron tubular radiation which is wall hung. The lobby section in this area is heated by Trane Force-Flo convector units. These units have two small fans in each one and a heating coil. The fan motors are two-speed and are controlled by thermostats. When these stat settings drop to 65F the units run at full speed; when 70F is reached the units drop to half speed; at 72F they stop entirely.

Piping

For supplying the unit heaters, winter supply units and radiators, the owner had sufficient low pressure steam at approximately 8 lb pressure to take care of the entire load, which amounted to some 27,000 lb per hr maximum. As this steam had to be brought quite a distance from the point of connection in the present building, and still maintain approximately

(Left) Projection-type unit heaters force heated air down to the loading platform from this unusual height. (Right) Close-up of the air washing equipment used for collecting and removing grinding dust from the atmosphere of the tool room.





(Left) Typical expansion loops in the steam and return lines. (Right) Cafeteria ventilation and heating are provided by the overhead wall units shown. Temperature controls are on the column at right. Expansion loops in the overhead steam main are seen in the background.

5 lb pressure in the new building, a supply line of 14 in. in diameter was required. This was calculated upon a basis of a 2½ lb drop in pressure.

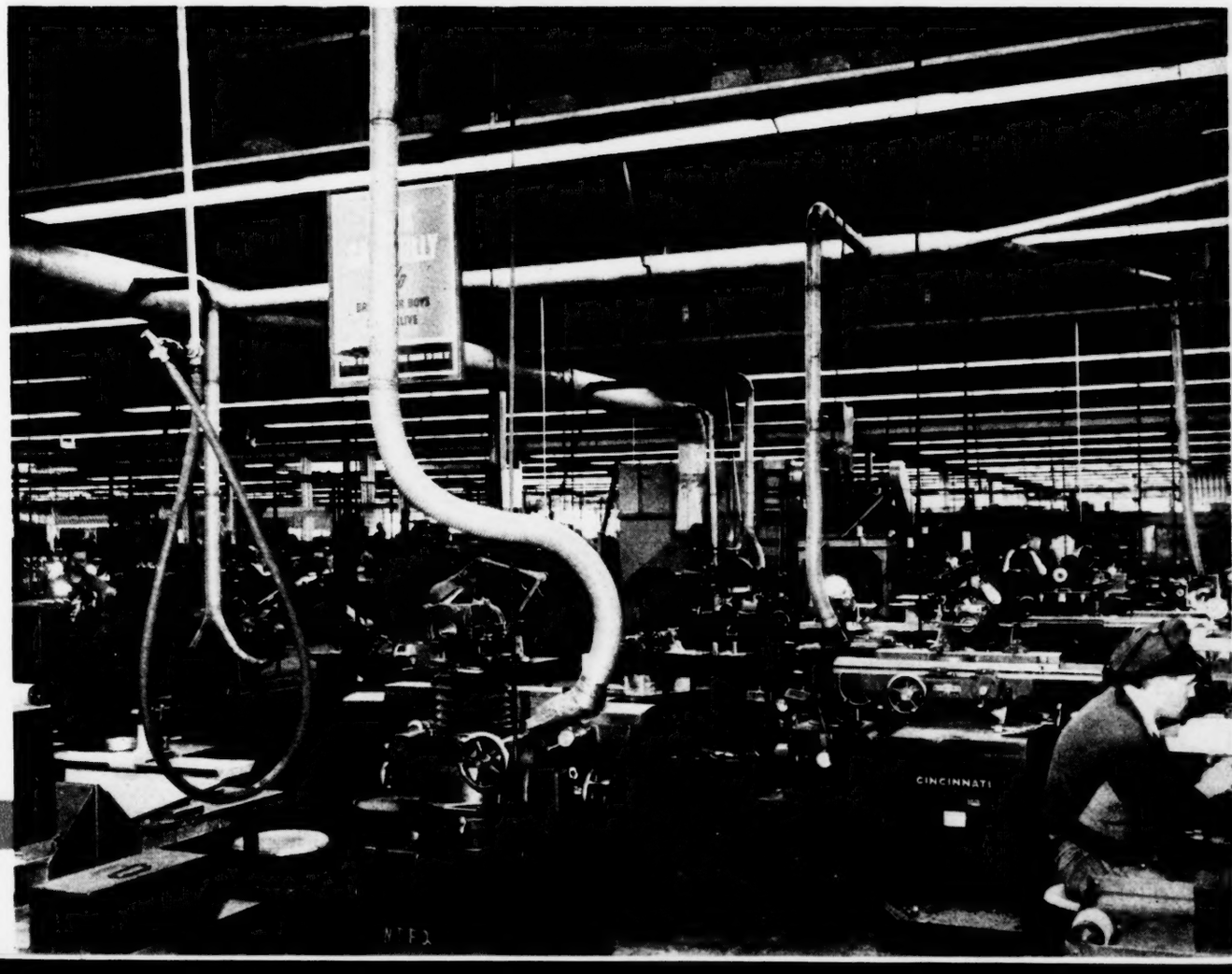
This 14 in line splits inside the building to a 12 in. header supplying the first floor and a 6 in. line supplying the basement units.

The returns from the heating units in the east half of the first floor all run overhead to a main header which discharges into a duplex pump and receiver unit at the east end of the building. The west half returns run to a header which discharges to a duplex pumping unit in the basement area. The discharge lines from these duplex units connect together before being carried back to an existing building where this line is connected to a present pump discharge.

Partial List of Suppliers

General Contractor	O. W. Burke Co.
Heating Contractor	Drake Avery Co.
Unit Heaters and Unit Ventilators	Trane
Starters for Unit Heaters and Ventilators	Clark
Thermostats	Friez
Temperature Control, Basement Units	Minneapolis-Honeywell
Traps and Valves	Sarco
Condensate Pumps and Receivers	Westco
Expansion Joints	Badger
Expansion U-Bends	Crane
Cast Iron Radiation	American Radiator
Brass and Iron Body Valves	Ohio Injector
Exhaust Fans	American Blower and Sturtevant
Pipe Covering	Philip Carey

The tool room atmosphere is kept free from grinding dust by collecting hoods at the individual machines. The air washer in the background removes all dust particles and returns the air to the room.



HUDSON NAVAL

Project Decentralized for Safety, Heated

A Project of ALBERT KAHN

ORDNANCE PLANT

by Central Steam System with Unit Heaters

By G. S. WHITTAKER and R. V. MEHAFFEY
Albert Kahn Associated Architects and Engineers, Inc., Detroit

THE heating and ventilating of the U. S. Naval Ordnance Plant at Center Line, Michigan, which comprises buildings of various sizes and which is operated by the Hudson Motor Car Company, includes many interesting features.

When this project was in its early stages there was considerable discussion between the Navy Department, Hudson, and the architects regarding the type and number of buildings to be constructed. The plan of decentralizing the buildings for safety in the time of, say, an air raid, so that if one building was hit the other buildings would still be able to function, was decided upon.

Various schemes for heating these buildings were talked over, such as unit heaters, central hot blast systems, and others, and after much discussion it was decided by all concerned to use a steam distribution system from a central power house with unit heaters and radiators in place of a direct-fired hot blast system. Process steam was needed anyway, and this scheme permitted killing two birds with one stone.

Tunnels and Piping

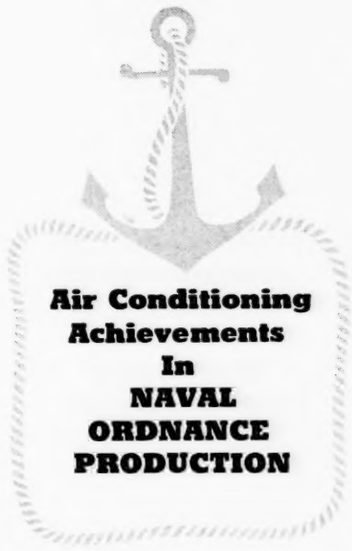
All service piping, including steam pump discharge, drips and water lines, is brought from the central power plant through a concrete tunnel designed to serve conveniently each individual building. The manner of avoiding piping interferences within the tunnel is of special interest to the heating engineer in that where service pipes are run together with numerous process pipes the system usually becomes complicated, particularly where branch connections and intersecting tunnels occur. Ordinarily this might give a blocked passage which would render the scheme useless. The fact had to be kept in mind that this tunnel was primarily for *service*, and from the maintenance department's standpoint as important a part of the project as any of the other buildings. Yet it is simple and economical in construction. In some areas of the tunnel a rather difficult piping cross-over was made in order to leave a full height walk space. This was accomplished by dropping the floor of the tunnel in this area a distance of 2 ft and dropping the piping into this space and covering same with subway grating. This allowed the walkways to be kept clear and made a very neat installation.

Heating Plant

Three boilers serving the plant are oil-fired multiple drum, bent-water tube type, and each one is designed to operate at a continuous actual evaporation of 60,000 lb of steam per hour, at maximum 200 lb gage pressure and 175 lb operating pressure. Feed water is supplied at 227F from a feed water heater.

Each boiler has an effective heating surface of 7,750 sq ft with a maximum heat release in the combustion chamber not exceeding 30,000 Btu per cu ft when operating at maximum load. Steam delivered to the main header contains not more than ½ of 1% moisture with the concentration of solids in the boiler water not exceeding 2,500 ppm and the alkalinity concentration not exceeding 300 ppm.

Oil burning equipment is of a wide range atomizing type capable of operating from maximum rating down to 25% and is designed for forced draft with a swinging front for servicing. Duplex oil pumps supply the system with 17,000 lb of oil per hour at 300 lb working pressure. This pumping system draws



the oil from storage tanks through preheaters and is completely equipped with discharge air chamber, relief valves, pressure gage, pump governor, control valve, and all the necessary piping connections to assure unfailing delivery. An auxiliary oil pump pumps the oil around through fin type electric heaters until it is sufficiently heated to atomize at the burner and generate steam to heat the oil with the steam heaters and run on the main pumps.

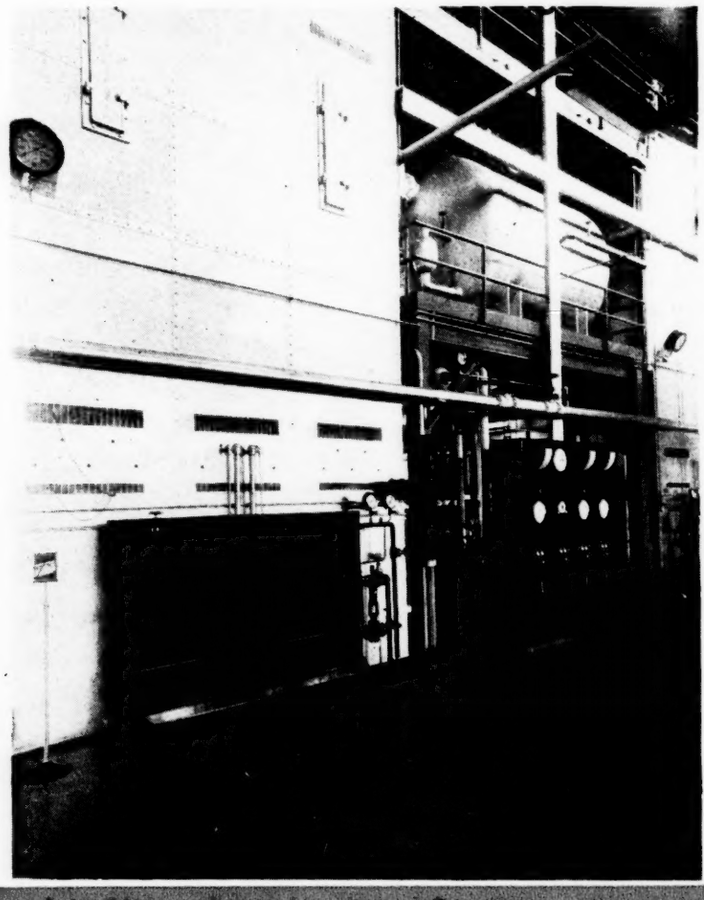
The air compressors for supplying compressed air to the various buildings are turbine driven with back pressure steam at 30 lb. This 30 lb steam line runs through the tunnel and runs into each main building where summer steam is required. This arrangement permits the use of all this exhaust steam at all times and means that these compressors are operated at a comparatively low cost.

Building No. 1

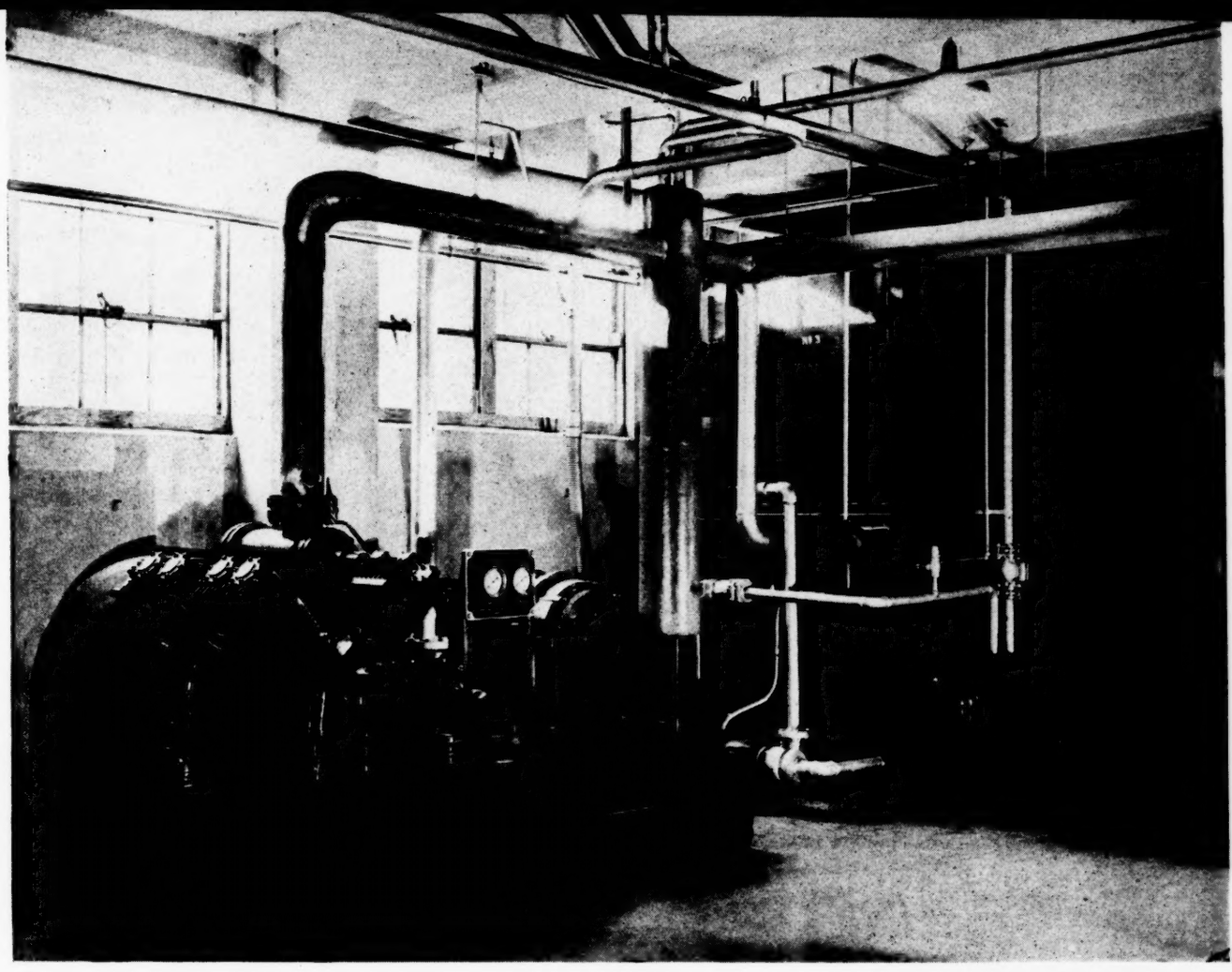
A 6-in. 175 lb steam supply main enters from the tunnel and rises to the roof where a 3-in. high pressure main runs across the end of the manufacturing area to serve two 2½-in. branch process mains which serve the building. There is also a 4-in. medium pressure steam main entering the building at this same point, which carries exhaust steam from the compressors in the boiler house. This line feeds the medium pressure heating system at 25 lb and is cross-connected through a pressure reducing valve to the high pressure steam main so that high pressure make-up steam automatically feeds in whenever building heat requirements are in excess of the amount of back pressure steam available. A simple network of supply and return mains serves properly spaced vertical projection type unit heaters located in the truss space throughout the manufacturing area. The unit heaters are all located in such positions as to be within reach of the service walkways as are also the valves which control them. This makes the work of the oiler and service man much easier. Large blower type heaters blanket the cold area at the base of the large outside service doors and insure a rapid recovery of building temperature. These heaters are controlled by magnetic starters, thermostats, and door switches.

Toilet rooms, elevated to permit the maximum working area at the floor, are heated by small propeller type unit heaters all supplied from the 25 lb steam system of piping. Roof exhaust units, 10,000 cfm each, housed in light-proof and weather-proof hoods, are provided to remove excessive heat from the working areas and to insure enough of an air movement in the summer to keep the building at approximately the outside temperature. The air exhausted is equivalent to five air changes per hr for the full height of the building. These exhaust units are controlled in groups of five or six from one master control station, an arrangement which facilitates the maintenance men's work. These master control stations are key operated and have pilot lights.

The north end of the building is devoted to office space and locker rooms. Two floors in height, the entire second floor becomes a locker room approximately 400 ft in length while the first floor is used for



Front of the Union Iron Works boilers, showing the Todd oil burners, feed water heaters, and control board.



One of the office building fan rooms, showing the Worthington refrigeration compressor and Trane evaporative condenser.

office, locker, and wash rooms. A branch from the 25 lb exhaust steam main heats this area after reducing to 2 lb pressure. This 2 lb line serves the cast iron and convector radiators in the office section of the building. The system is of up-feed design with the low pressure steam and return mains in a 4-ft square pipe trench below the first floor from which connections are run to the first floor radiators and risers to second floor radiators. The condensate return mains run by gravity to two duplex pump and receiver units located in pump rooms at the northeast and northwest corners of the building.

The returns from the 25 lb steam system serving the unit heaters are collected overhead and discharge to these same pump and receiver units. The high pressure drips in this building are run to flash tanks in the truss space where the pressure is reduced to approximately the same as the medium pressure returns and before connecting to same.

A new section has just been added to this building which is completely dust free and is completely closed off from all the rest of the building except for the service doors.

This area is served by heating and ventilating equipment made up by means of large fans, blast coils, filters, and the like, located in a convenient place for economical distribution of the duct system. The filters in this area are serviced frequently in order to keep them operating as efficiently as possible, as it is very important to the operations performed in this room that the air be as clean as possible. Steam for this unit is supplied at 5 lb pressure from the high pressure main through a pressure regulating valve, and the returns discharge to a pump and receiver unit in the fan room.

Buildings No. 2, No. 3, No. 4, and No. 5

These buildings are similar in construction and equipment to Building No. 1, although smaller in size, and are similarly heated by means of unit heaters located overhead in the manufacturing area and radiators in the office section. In each building steam and pump discharge lines are supplied from the main tunnel in the same manner as in Building No. 1.

Building No. 6

This building is of one story construction with some office sections and small locker and toilet room areas. Steam is brought to this building at 165 lb pressure and reduced to 30 lb through a reducing valve station before supplying the heating system.

The main part of the building is heated by overhead unit heaters of the vertical type with convector radiators in the toilet and locker rooms. These radiators are supplied with 30 lb steam the same as the unit heaters. The radiators in the office section are all supplied with low pressure steam at 2 lb pressure and a separate return runs back to the receiver. The other returns also run to this same duplex condensate pump and receiver unit which discharges to the common header in the tunnel.

All unit heaters are controlled essentially the same as the main building.

Building No. 7

This building is heated in the same manner as Building No. 6 except that there is no office section or low pressure steam.

Building No. 8

This is a two story structure with a large skylight over the center of the second floor to give a maximum of light. The first floor is devoted to manufacturing machine work and is heated by overhead vertical type unit heaters. This allows both the supply and return lines to be run at the ceiling. The second floor operation is such that radiators under the side wall windows were deemed necessary.

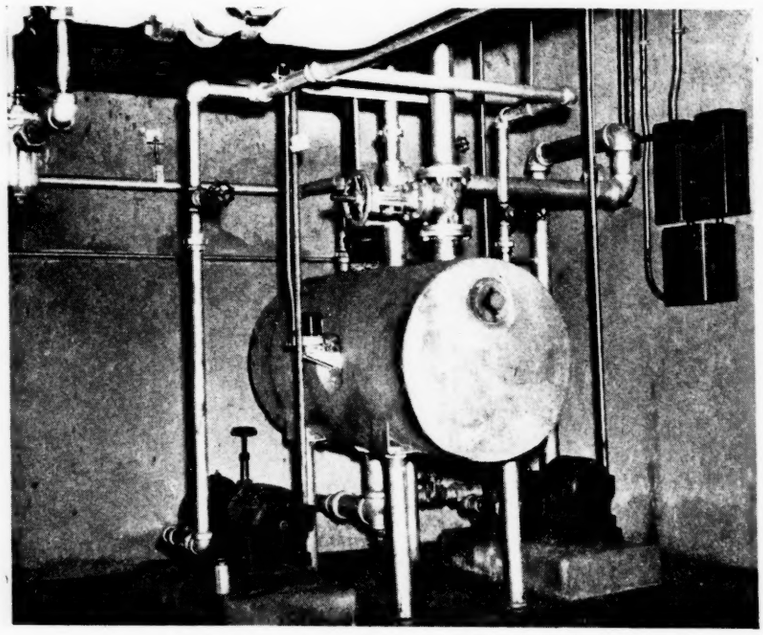
Cast iron radiators were installed under the windows all along the side walls but some unit heaters with Anemostats were placed in the large monitor to take care of any cold down drafts in this area. The low pressure supply and return mains which supply the unit heaters for the first floor and the radiators on the second floor are run on the first floor ceiling and the returns run by gravity to the two condensate pump and receiver units located in the pump rooms at the ends of the building. The units in the large skylight on the second floor are supplied with steam at 30 lb pressure, and these mains run in the trusses before dropping to the first floor ceiling and connecting to the receivers. The steam and pump discharge lines are brought to this building through Ric-wiL underground conduit from Building No. 4, and the steam line is at boiler pressure. Two pressure regulating valves serve the building, one reducing the pressure from boiler pressure to 30 lb for distribution to the second floor unit heaters and the other from 30 lb to 5 lb for supplying the radiators and first floor unit heaters.

All the unit heaters have three position starters and thermostats, as described previously.

Building No. 9

This is a one story building, devoted to strictly non-productive activities. The building is completely ventilated but not cooled in the summer. There are two supply units in the basement complete with coils, fans, and motors, which supply clean fresh air to all parts of the building at room temperature. The heat loss in the building is taken care of by wall-hung convector radiators under each window, and these radiators are supplied with steam and return connections from the mains which run in the 4 ft square trench below the floor.

Steam is brought to the building at high pressure through Ric-wiL underground conduit from the main



Typical pump room at end of tunnel entrance to building showing Westco condensate pumping units and piping.

tunnel and is reduced in the basement to 5 lb before being distributed to the heating system. A separate 5 lb steam line is carried across the basement ceiling to serve the booster coils in the supply fans. All the returns from these coils, as well as the return mains from the direct radiation, run by gravity to a duplex pump and receiver unit in the basement before being discharged back to the main pump discharge line in the tunnel.

Building No. 10 — Cafeteria

The Cafeteria Building, which is operated 24 hr a day, 7 days a week, is inter-connected for piping purposes by a tunnel with the office building. The 25 lb steam main which supplies the south fan room of the office building continues through this tunnel to serve this most important building.

The building is heated by direct radiation as well as a hot blast system in a manner similar to that installed in the office building. Of special interest to the designing engineer, however, is the complete and compact arrangement of the kitchen equipment in which steam plays an important part in the chef's culinary operations.

This kitchen was designed to prepare food for approximately 30% of the employees, including delicacies baked in the plant's own spotlessly clean bake shop. The majority of the employees eat at their machines and are efficiently served through lunch wagons that cover all buildings.

The floors are quarry tile with walls of glazed tile with equipment trimmed in stainless steel. The cook's refrigerator is located conveniently near the roasting ovens and kettles. The butchering equipment includes electric saws, choppers, grinders, and slicer. The ranges and roasting ovens are also electric while the kettles are supplied with 25 lb steam.

The kettles, ranges, and ovens are all located under a 20 ft long canopy which is exhausted through the roof. The cook's tables, sinks, bain-marie, and similar equipment, are located on either side with trucks as required.

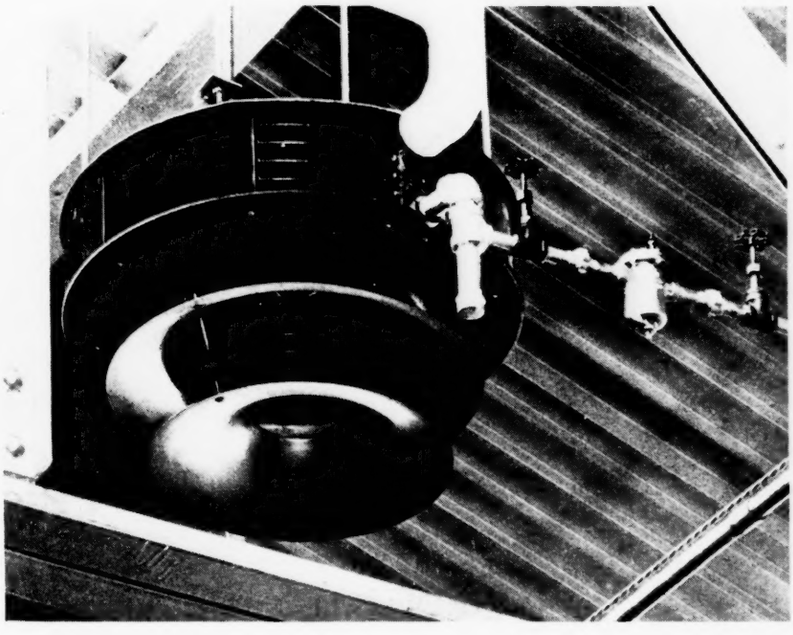
The steamers which are supplied with 5 lb steam and the electric fryers are located under another canopy which is also exhausted through the roof. There is a 25 lb steam connection into each one of these canopies with a valve within convenient reach of the floor for smothering any grease fires which may start in them.

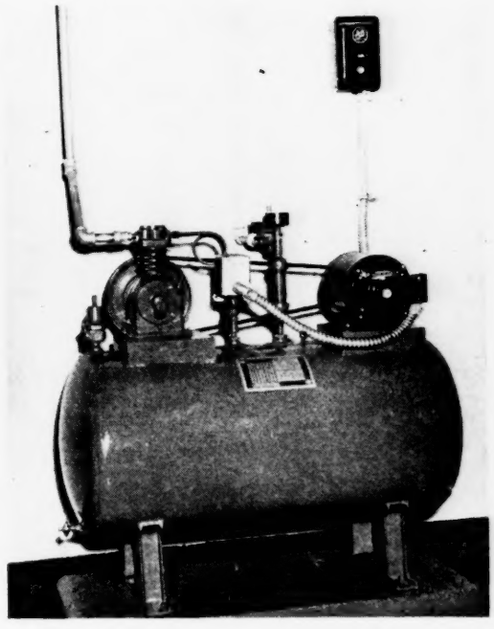
Separate refrigerators supply the chef with vegetables and dairy products at any desired temperature.

Any accumulated garbage is kept under refrigeration until such time as it can be disposed of by truck or incinerator. All dishes, bottles, and pans are thoroughly washed in the dishwasher and pot sinks and are scalded with steam, if necessary, before being put away in their respective compartments.

There is a steam room in this kitchen which is used for keeping the bottled coffee hot enough for use in the plant for those men who prefer to bring their own lunches. This bottled coffee is placed in bottle cases (24 bottles per case) and stacked in the steam room and the steam coils turned on from outside the room. There is also a perforated coil below the metal floor of this room for liberating steam through 1/16 in. diameter holes, which serves to humidify the

(Left) Typical installation of one of the Trane projection type unit heaters using an Armstrong trap. (Right) Air for operation of the Minneapolis-Honeywell controls is supplied by this compressor.





room and helps to keep the wooden cases from drying out too quickly and falling apart after a very short period of use. The temperature is kept at approximately 180F, and the coils have a temperature control valve actuated by a thermostatic bulb located just inside the room, with the adjustment dial outside the room where it can be changed without entering the room. The perforated coils are hand controlled and are only turned on as required.

In the cafeteria proper four separate counters serve the workmen, each one complete with all equipment and supplies necessary for serving complete meals.

To make this area more comfortable during meal hours it is completely air conditioned, the air being kept fresh and clean and properly tempered at all times. This conditioning unit handles 27,000 cfm and is located in the basement machine room and supplies the tempered air through concealed duct systems and ceiling outlets along either side of the building. A 100-ton compressor of the reciprocal type serves this unit for cooling in the summer.

There is also a complete cafeteria exhaust system which discharges odor-laden air through an exhaust fan to the outside. This fan is located in a fan house on the roof over the kitchen.

There is also a complete exhaust system serving the kitchen which exhausts 14,000 cfm through the canopies over the equipment, by means of an exhaust fan located in the same roof fan room. Clean tempered air replaces that exhausted from the kitchen. This is brought in by a 16,000 cfm fan unit also located in the roof fan room.

Needless to say, this building serves its purpose very well. Such excellent equipment makes it a quiet and restful place in which to relax before going back to turn out vitally needed war material.

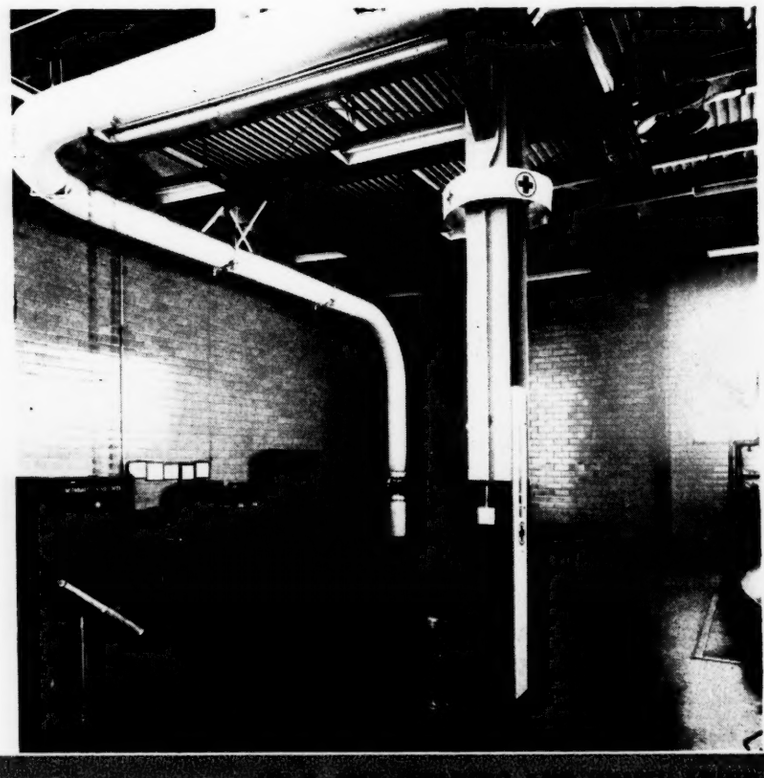
Building No. 11—Office Building

The two story office building is heated by means of direct radiation in convector cabinets and by forced warm air. As the work on this project was completed before the restriction of critical materials was too severe, the building is conditioned summer and winter, affording healthful and comfortable conditions for its occupants and maintaining efficiency at its peak.

Steam and pump discharge lines enter the building through the part basement from the main tunnel. The 25 lb steam is reduced to 5 lb before being distributed through a 4 x 4 ft trench to supply the radiation. This trench is located along the outside wall just below the first floor. The building is divided into four zones and each zone is controlled through an electrically-operated zone control valve actuated by a combination of outside and inside thermostats. These stats are located on the first floor in the large general office areas where a uniform temperature is more apt to occur than in a private office.

A separate 25 lb steam main serves the two air

Corner of power house, illustrating the main 12 in. steam line dropping to the tunnel. A Trane projection-type unit heater can be seen at the upper right.



conditioning systems. Steam is supplied to fin type coils through combination pressure reducing and thermostatic valves. These valves have two pilots, one of which controls the pressure and the other the air temperature through a duct stat.

These conditioning units are located at either end of the building and supply filtered and tempered air to the entire building except toilet rooms, stairways, and vestibules. Each unit handles 22,500 cfm of outside or recirculated air as desired, or a mixture of both.

Cooling is accomplished by means of direct expansion coils supplied through reciprocal type compressors and evaporative condensers.

Condensate from the direct and indirect systems flows by gravity to duplex pump and receiver units located in the two fan rooms. The pump discharges run through the branch tunnels to the main tunnel where they connect to the main pump discharge running back to the boiler house.

Building No. 12

This is a comparatively small building, typical of numerous such structures which every large plant requires and very little heat is needed for it. A blower type heater at the large door with vertical unit heaters for the rest of the building, all supplied with steam at 30 lb pressure from the Power House, takes care of this small building quite satisfactorily. The returns run by gravity through the main tunnel to a small pump and receiver unit in the basement of the power house.

Building No. 14

This small building is approximately the same size as Building No. 12 and is heated in practically the same manner.

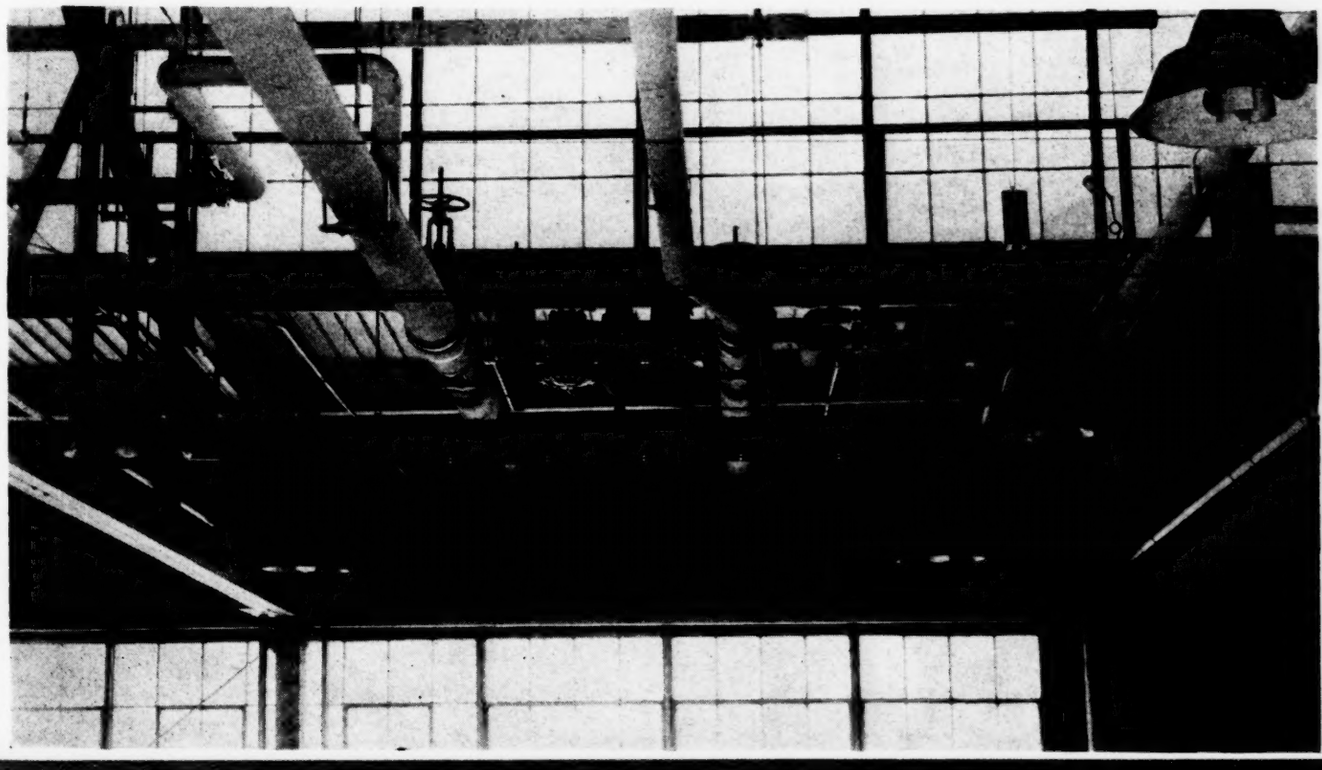
Building No. 15 — Incinerator

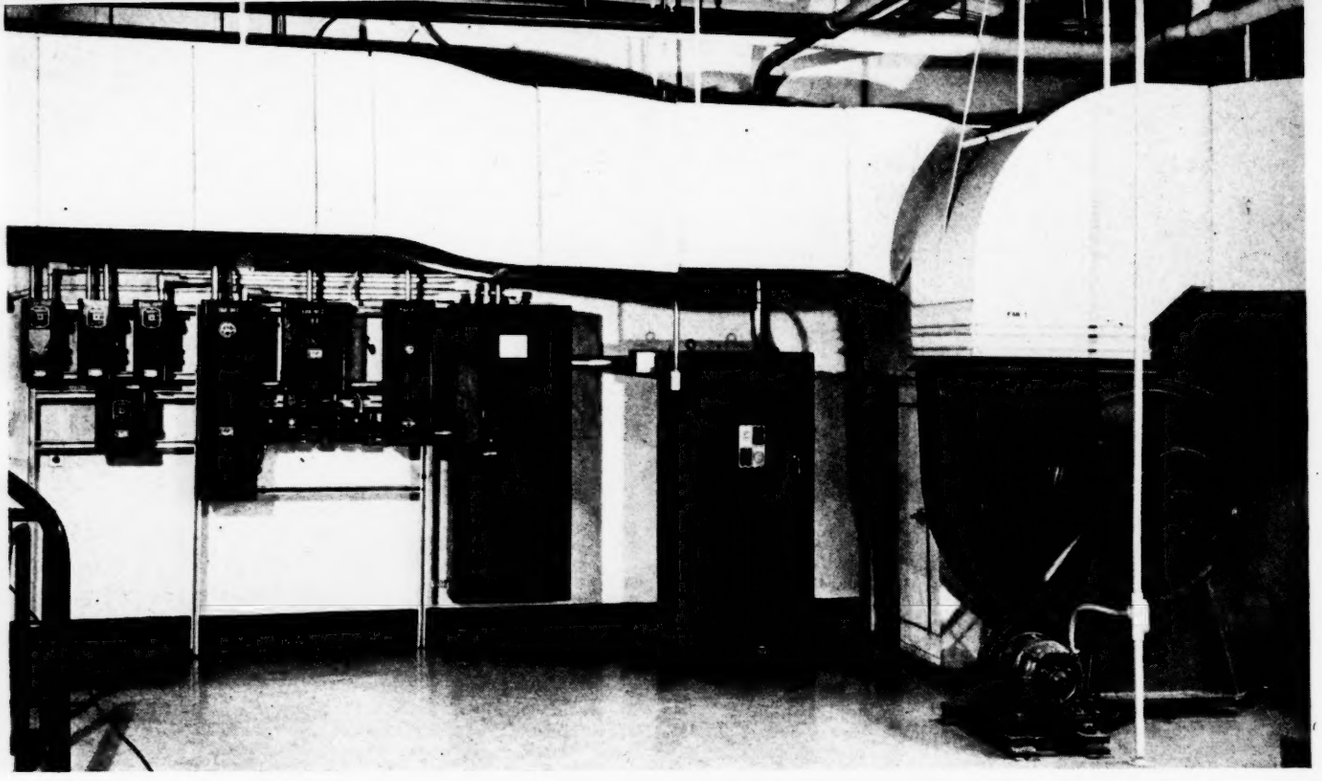
This building is also small and, of course, requires very little heat. There is a small toilet and locker room which is heated, and there is one unit heater installed on the operating floor to keep the piping from freezing during shut down periods which, as can be imagined, are very few and far between during this vital war effort.

Steam and return lines are brought over to serve this building from the scrap building in Ric-wiL underground conduit. Steam is supplied at 30 lb pressure the same as for the other small buildings.

This plant was designed by Albert Kahn Associated Architects and Engineers, Inc, Detroit, Mich., under the direction of Hudson's Plant Engineering Department, subject to the approval of Hudson executives and the Navy. The general contractor was Bryant & Detwiler Company, Detroit; heating and ventilating was by Drake-Avery Company and Bassler-Carter Company, both of Detroit; and American Refrigerating Company, of Detroit, handled the air conditioning.

View showing a typical Spence Engineering Co. steam pressure reducer in the manufacturing buildings.



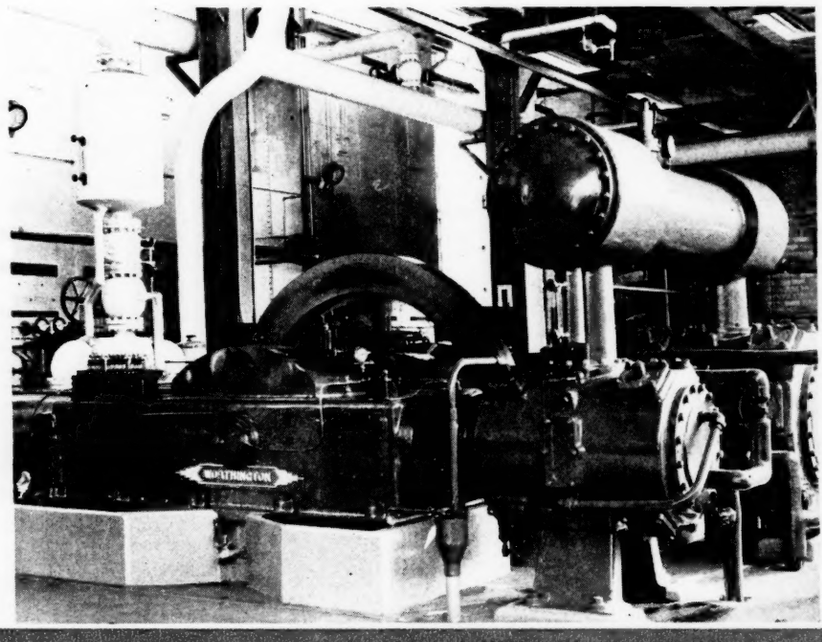


Equipment room in the office building, showing Sturtevant exhaust fan.

PARTIAL LIST OF EQUIPMENT SUPPLIERS

The Allen-Bradley Co. ..... Motor starters
Armstrong Machine Works ..... Steam traps
E. B. Badger & Sons Co. ..... Expansion joints
Bailey Meter Co. ..... Boiler control and meters
Clarage Fan Co. ..... Induced and forced-draft fans
Crane Co. ..... Valves, fittings, and cast iron radiation
Detroit Brass & Malleable Works ..... Malleable fittings
C. A. Dunham Co. ..... Convectors
Graver Tank & Mfg. Co. ..... Fuel Oil Tanks
Jenkins Bros. ..... Valves
Keasbey & Mattison Co. ..... Pipe covering
Minneapolis-Honeywell Regulator Co. ..... Controls
National Tube Co. ..... Pipe
Ric-wiL Co. ..... Underground conduit
Murray W. Sales & Co. ..... Pipe bends
Spence Engineering Co. ..... Pressure reducers
B. F. Sturtevant Co. ..... Fans
Superior Die & Stamping Co. ..... Pipe hangers
Todd Combustion Equipment, Inc. ..... Oil burners
The Trane Co. ..... Unit heaters, ventilators, and traps
U. S. Gauge Co. ..... Pressure gauges
Union Iron Works ..... Boilers
Worthington Pump & Machinery Corp. ..... Air compressors
Westco Div., Pomona Pump Co. ..... Condensate pumps
Youngstown Sheet & Tube Co. ..... Pipe

View of the compressor room in power house, showing the Trane projection-type unit heater over-head.



The new RCA Laboratories at Princeton, N. J., where advanced research and pioneering in radio work is carried on.

RCA Research Laboratories

has two air conditioning systems and three separate ventilating systems, with emphasis on high purity, low humidity and noise-proofing. System described by Frank W. Buck, Chief Mechanical Engineer, The H. K. Ferguson Co., Cleveland.

ALMOST from the earliest beginnings of radio and wireless communication the name RCA has been among the foremost in its field. The organization behind the name has pioneered untiringly since its inception, and its results in the creation of the phenomenal and the development of the previously unheard of have undoubtedly contributed to its singular position in the radio industry.

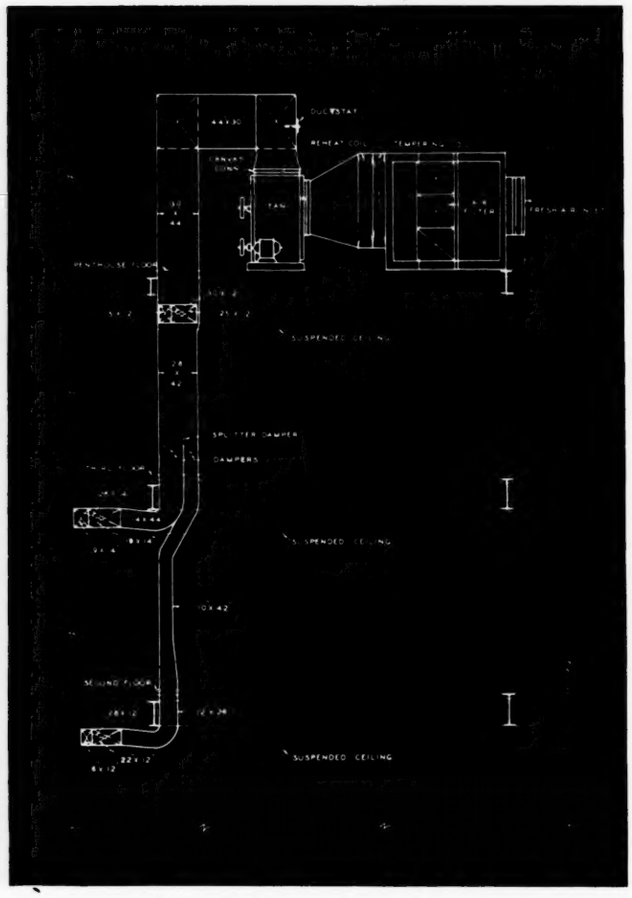
It is, therefore, only logical for Radio Corporation of America to possess what eventually will be the world's largest laboratories for radio research. And although size is important to the scope and extent of such an institution, an even more significant fact is that RCA Laboratories, Inc., at Princeton, N. J., are also the most modernly equipped facility of their kind in existence.

To the designing engineers and builders of RCA Laboratories, this tremendous development program presented many an interesting problem. There is hardly a more specialized research laboratory in the United States, nor is there a research laboratory with a broader goal.

The Laboratories were conceived and designed to fulfill a two-fold purpose, later summarized in the following statement by Otto S. Schairer, Vice President in Charge of the Laboratories, at the groundbreaking ceremony in August, 1941:

"While radio and electronics are vitally important to armed forces on land and sea and in the air, still their greatest usefulness to mankind is as a messenger and servant of peace."

The actual construction program was divided into



Three central ventilating systems, with the equipment in the penthouse, supply the main building with fresh filtered and tempered air.

two parts. The first unit already is completed and is housing many activities that are benefiting the American soldier, sailor and airman in every part of the world. The second phase is being reserved for the post war period, when it can be utilized in the accomplishment of the full objective set for it by David Sarnoff, President of RCA, who said:

"I think that the establishment of RCA Laboratories offers a great measure of security to our organization. There is no security in standing still. Those who rest on the rock of stabilization sooner or later find that that rock becomes their tombstone. There is no security in the mere knowledge of today. There is hope and opportunity in what we can learn tomorrow. That is the greatest asset on the balance sheet of humanity and on the balance sheet of any organization engaged in scientific pursuits."

Type of Structure

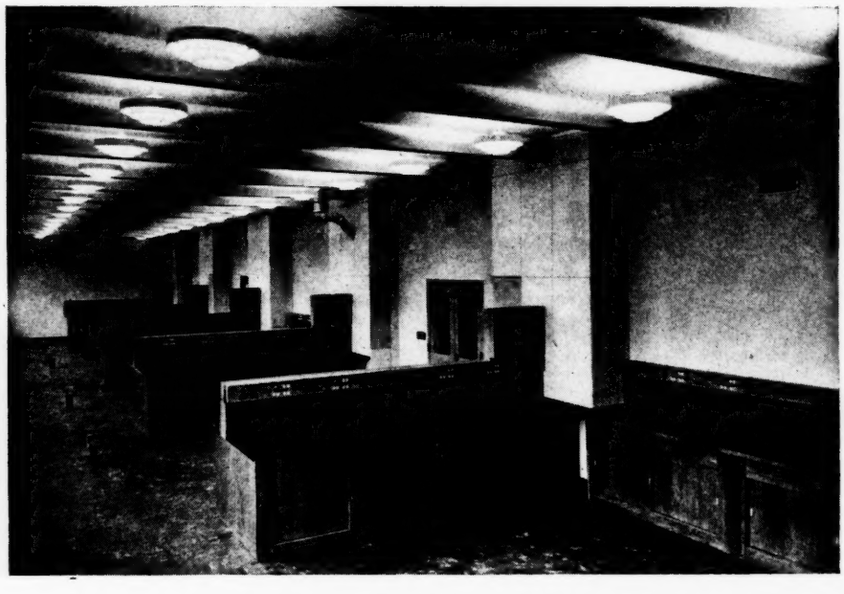
The Laboratories building is a three-story structure with 488-ft. corridors into which open 150 laboratory bays—laboratories which show that modern radio is a science spreading into many fields: electronics, sound acoustics, chemistry, physics, mechanics, optics, cathode ray tubes, fluorescent materials, lenses, photography.

There also is a large, one-story factory type model shop building adjoining the main structure, and its operations range from huge punch presses capable of pressures measured in tons to gauges accurate to 5 millionths of an inch.

Construction consists of reinforced concrete foundations, basement walls, floor and roof slabs and brick exterior walls. The exterior face brick is buff, with limestone trim, while the structural frame is steel. The roof slab is insulated with vermiculite concrete insulation averaging about 3-in. in thickness. Pitched roofs are gypsum plank with 1-in. insulation covered with smooth surface composition roofing.

In general, concrete floors in the three-story portion have 3-in. porous concrete fill with 1-in. cement topping to provide for underfloor services. Floor finish in most of the building is asphalt tile with rubber cove base. Interior partitions are mainly 3-in. gypsum tile plastered on both sides. Toilet partitions are glazed tile, and stair partitions and partitions in the model shop are clay tile painted.

The laboratory section is provided with complete laboratory services, installed in vertical shafts located at interior columns. These shafts are fitted with removable panels for accessibility, thus giving a high degree of flexibility to the entire system. There are 104 vertical shafts which rise from base-



The spacious laboratories are set off by removable panels which permit easy alteration of the size and shape of the rooms. Each bench is equipped with outlets for electric current of almost any phase, a-c or d-c. Air inlets are shown in the wall near the ceiling.

ment to penthouse, leading their services to 420 workbenches.

The services consist of hot and cold water, compressed air, gas, oxygen and hydrogen distribution systems, chemical drains and neutralizing chambers, hood exhaust and ventilating systems—all installed with a minimum of exposed and unsightly piping and ductwork.

Services are extended from the shafts in racks along the walls behind benches with connections to bench outlets, sinks and hoods. They are installed on standard racks with uniform arrangement, and all services are equipped with plugged outlets at each floor, providing a maximum of flexibility. Pipes extending through benches are provided with plates and standard laboratory fixtures.

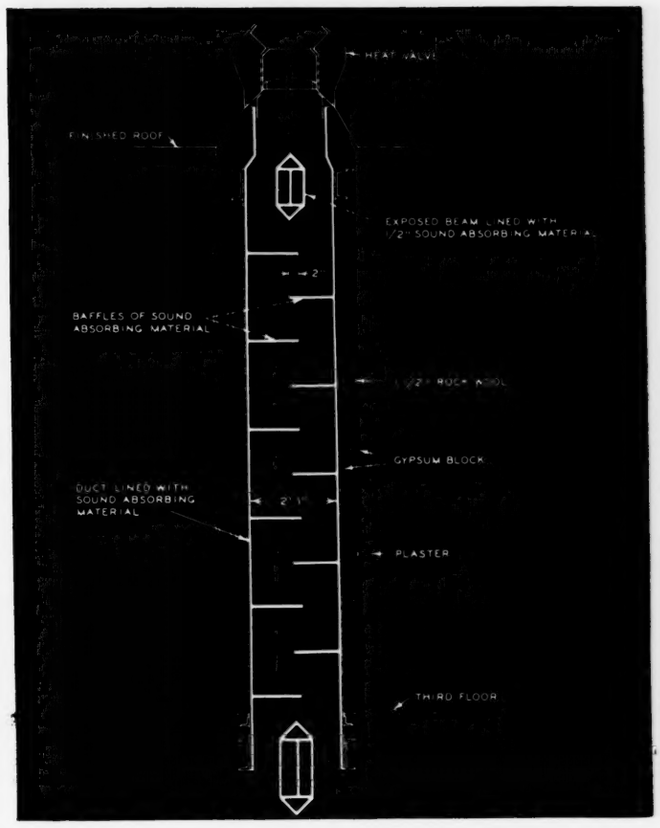
Heating and Ventilation

The general heating and ventilating systems for the main building consist of a low pressure steam two-pipe system with vacuum return, supplying tube and fin type enclosed convectors, supplemented by three general ventilating systems—one at either end of the structure and one in the center. The model shop is heated by conventional unit heaters with special units to provide fresh air for ventilation.

The heating system for the main building is divided into four zones, each controlled from outside thermostats through modulating steam valves regulating the steam flow to each zone.

Tube and fin type convectors with integral valves and traps are located in enclosures below windows, and may be removed as a unit through bottom grilles. Enclosures are of two sizes throughout the building, and are spaced on 6-ft centers. Radiators of the same size are interchangeable, a factor which allows for adjustment of the heating system to conform with possible partition relocations.

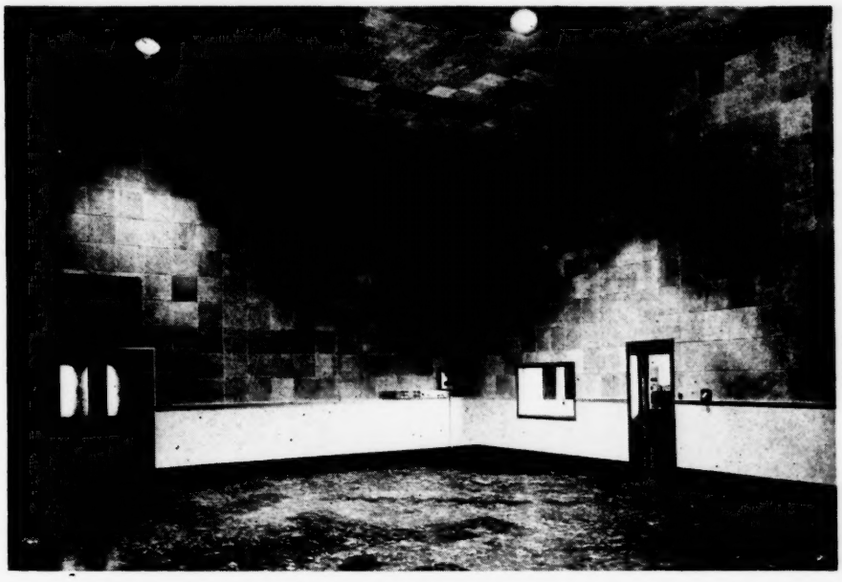
The three general ventilating systems supply the main building with a nominal quantity of fresh-filtered and tempered air. Each system consists of a louvered and screened fresh air inlet with automatic louvers, dry type air filters with replaceable filter media, tempering and heating coils and ventilating fans driven through V-belt drives by electric motors. The equipment for each system is located in a separate penthouse.



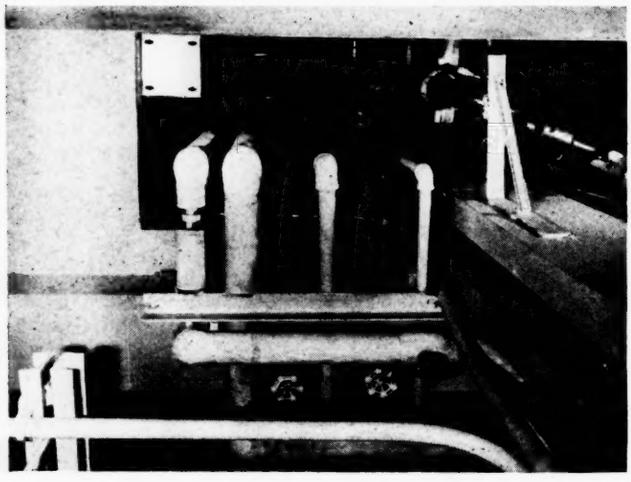
Ventilation of the free field sound laboratory is accomplished by means of this soundproofed exhaust duct extending up through the roof and surmounted by a heat valve. Note the sound treatment of the beams.

Heating System Controls

The steam supply to preheating coils is controlled through a two-position valve by outside thermostat, while the steam supply to reheating coils is controlled through a modulating valve by a thermostat located in the discharge from the reheating coil to maintain desired temperature of air entering the duct system. From the fans the air is discharged



View of the two-story 36 x 48 ft television laboratory and studio, with the control room shown at the right and ventilating air inlets and outlets in the wall and ceiling respectively.



Vital services including hot water supply and return lines, carbon dioxide, gas, hydrogen, compressed air and acid drain lines, are carried up through 104 vertical shafts to the work benches on the various floors.

through a system of ducts and distributed to the various laboratories and offices.

Boilers

Steam for the entire project is provided by two oil-fired low pressure firebox type boilers with automatic control, located in a boiler house remote from the main building. Other boiler house equipment includes two motor-driven air compressors, complete with intake filters; silencers, after-cooler and receiver for supplying compressed air to the system and an oil-fired incinerator for the disposal of combustible waste.

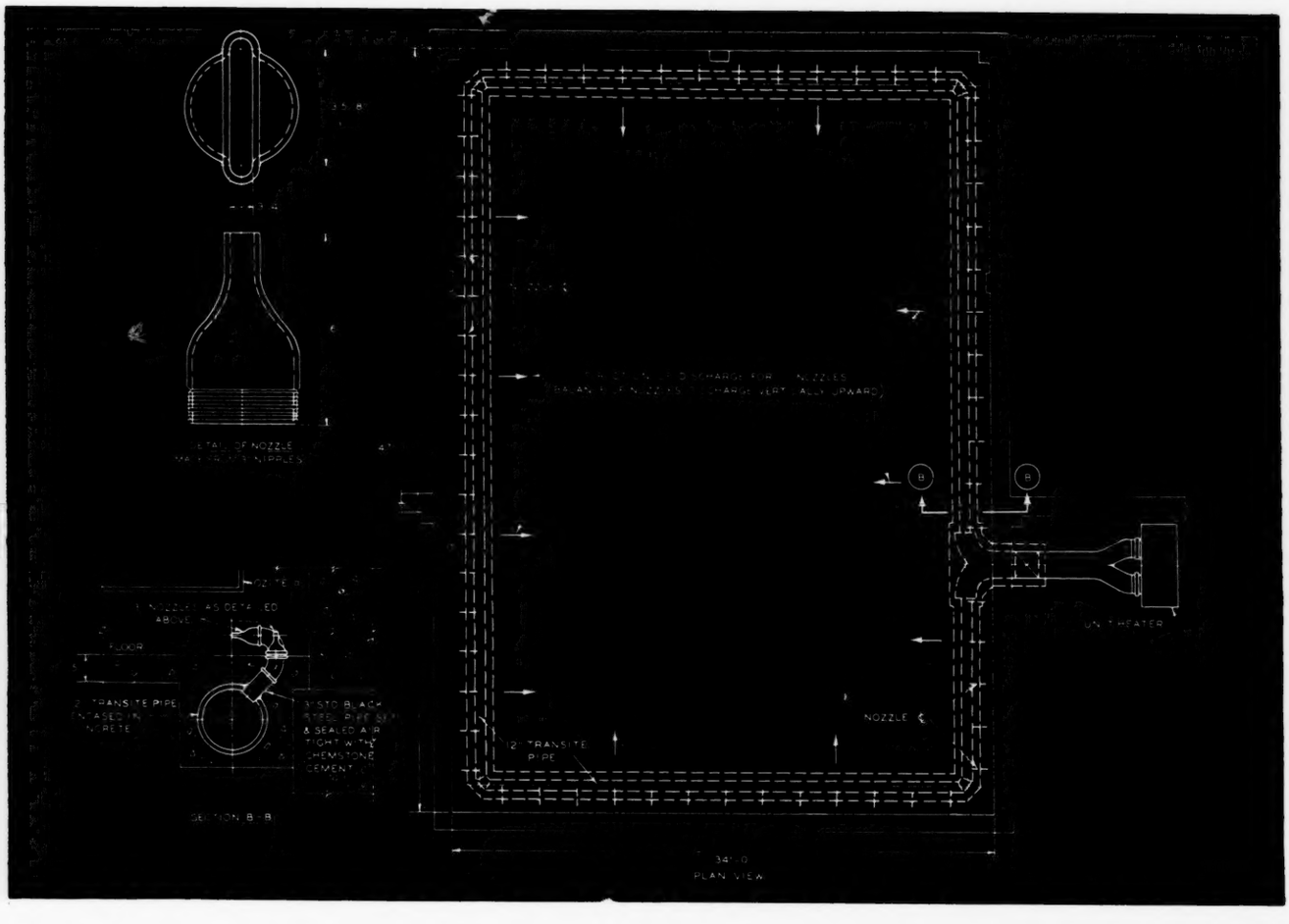
Underground steam and return lines installed in a pre-sealed insulation supply system carry the necessary steam for the main buildings from the boiler house.

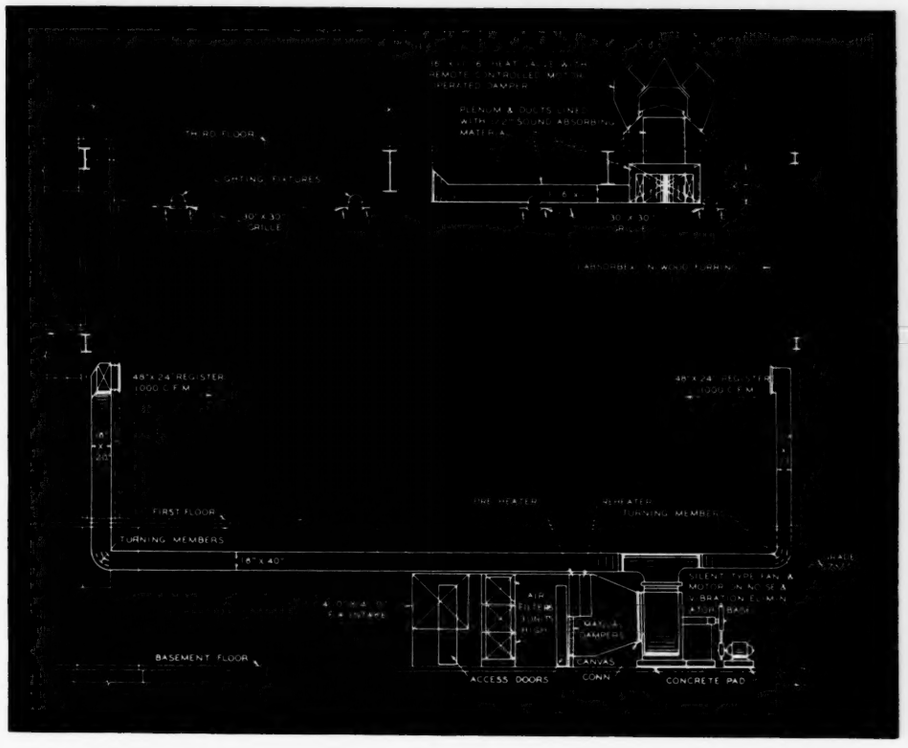
Because of the anticipated oil shortage along the Eastern coast, boilers were provided with temporary grates for firing anthracite buckwheat coal.

Air Conditioning

Three of the laboratories are air conditioned—the Chemical Laboratory, the Electron Microscope Room and the Glass Optics Division. The Chemical Laboratory, closely identified with television, is designed with completely dust-proof rooms for experiments with fluorescent or *glow* materials, used to sharpen television's eyesight. Here exhaustive studies of the art of luminescence are being made in search for methods to amplify light as efficiently as electronic tubes amplify sound. The Electron Microscope Room and the Glass Optics Division, the bays of which are ingeniously connected with door-like

Plan view and nozzle details of the ventilating and drying system for the free field sound laboratory. View taken at the basement level.





Sectional elevation showing the ventilating system for the sound studio. Extreme precautions are taken throughout the system to insure a maximum of silence in operation.

windows in the walls to make possible long focuses through the rooms, also have highly specialized uses requiring air purity. Two air conditioning systems provide this service for the laboratories.

System No. 1 is designed primarily to maintain a low humidity, remove sensible heat and provide an atmosphere of nominal cleanliness. This system consists of a standard air conditioning unit, using well water at a year-around temperature of 54F as a cooling medium, with a system of supply and return ducts. Fresh air is supplied from a louvered and screened fresh air intake through anti-freeze tempering coils. All filters are of the dry type.

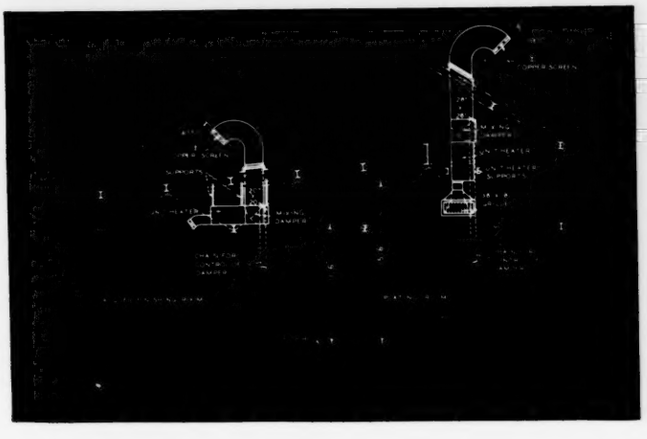
System No. 2 is designed to provide an atmosphere of high purity. The equipment for this system, located in the penthouse, consists of a screened fresh air intake with automatic louvers, pre-filters, pre-cooling coil, and electrostatic air cleaner, followed by a dry type filter as used in the ventilating systems; a ventilating fan driven through a V-belt drive by an electric motor; heating and cooling coils for supplying hot and cold air distribution ducts, and a humidifier located in the hot duct.

Air Distribution and Control

Air is distributed from hot and cold ducts to each room served by the system through individual supply ducts, while temperatures in the various rooms are controlled by thermostats which operate mixing dampers in the hot and cold ducts and regulate the temperature of air supply to each room. Air is returned to the system through common return ducts. Steam to the heating coil is controlled through a modulating valve governed by a thermostat in the cold duct. Humidity control is regulated by a humidistat in the return duct, and limited by a glass surface humidistat to control condensation.

Air pressures of a consecutive order are maintained manually in each of the several air conditioned rooms. Fresh air quantities are dependent on the amount of air exhausted by process exhausts and that lost through exfiltration.

(Left) Fresh heated air for ventilating the lacquer finishing and plating rooms is furnished by suspended horizontal or vertical unit heaters as shown. (Right) Heavy ozite baffles surrounding the lattice-steel working platform provide almost absolute quiet for testing purposes. Pipe railings are filled with sand to prevent resonance due to vibration.



Proper Steam Trap Maintenance Aids Fuel Conservation

Application of building insulation and improving combustion efficiency are fairly obvious ways of obtaining fuel conservation. Not so obvious, perhaps, are the correction of more or less hidden faults in the heating system.

The accompanying article suggests that more consideration could well be given by everyone involved to the repair and replacement of faulty traps and valves in steam heating systems.

AUTHORITIES in the heating industry are agreed that one way to save fuel during a national emergency is to make heating systems efficient. The War Production Board gave this point indirect recognition when it eased the restrictions on heating specialties in its amended CMP Order No. 5 of May 14. The old priority rating of A-10 on steam traps, valves, vents and controls had become almost valueless. The new AA-5 granted in its place gave promise of improved deliveries and of needed replacement materials for the manufacturers. The AA-2 preference rating was re-established at the same time for required maintenance, repair and operating supplies for a considerable list of important industries.

The whole heating industry at the time was faced with one of its greatest conservation responsibilities. A difficult winter had ended and untold thousands of large heating plants needed immediate and thorough-going attention. There was need of prompt inspection, cleaning, repairs and replacements, and considerable added equipment to place the plants in first-class condition so as to leave them ready for service in the coming season. And few industries ever have had a better opportunity to win public good will and abiding customer satisfaction. In the public mind heating is a high form of technical service, doubly essential during a war period.

Heating a Form of Transportation

The whole project of heating may be regarded in terms of transportation. First, the transportation of fuels is one of the country's largest tonnage requirements. Then the distribution of heat throughout a structure is again a form of transportation. The boilers develop the heating medium; but some arrangement of piping roads must serve to deliver the heat to the locations where it can be usefully applied. When the piping system has been well designed and equipped, the transporting of heat is speeded and facilitated.

The hot water systems make splendid use of mechanical circulators. The steam systems employ rather simple pressure differentials, although the varying pressures may be attained as much by return line vacuum pumps as by boiler steaming power. In the return line systems the distribution of heat is aided not only by lowering pressure at the ends of the pipe "tracks," but also by withdrawing the air ahead of the steam flow. It appears that somewhat in this manner the case for economical heating may be best presented to the American public and to the WPB officials who hold control over materials and supplies.

It is not so much a question at the moment of modernizing heating plants or steam-supplied industrial equipment as a matter of putting all such installations in first-class working order. Competent heating men who know conditions in the field report there are literally thousands of large heating plants which are wasteful and inefficient. Many are in that condition because the owners or operators are not aware of the facts. The high fuel costs are blamed on indifferent or untrained employees. The costs are absorbed as a matter of inescapable overhead expense.

It appears to be in line with the history of heating that a considerable number of buildings and plants will always be found with deficient or defective heating systems. The important thing now is that a war emergency must reduce fuel supplies and at the same time demand the elimination of waste. Those who must point the way are the qualified heating engineers who alone can offer effective recommendations. Great numbers of heating plants need cleaning, inspection, repairs, replacements, equipment tests and adjustments, corrections of faulty design, and here and there some additions of capital goods which are essential for fuel savings and true operating economies. CMP Regulation No. 5 seemed to state quite clearly that minor capital additions were permitted under maintenance, repair and operating procedure where the cost of any one complete addition does not exceed $500, excluding the purchaser's cost of labor.

Corrective Measures

Instances have been mentioned of tall buildings where the top floors are difficult to heat. To keep

them at even 66F would mean at least 76F on lower floors. It is a condition familiar to the experienced heating man. Proper zoning and controls could have eliminated the defect from the first. What to do now is a separate and expert study in each case. This is no attempt to be specific.

Some usual suggestions in such cases are that extra radiation be added to upper floors or distant locations, as the case may be, on the theory that it is less costly seemingly to overheat some sections than to overheat a whole structure so as to reach lagging corners. And sharp attention will be given to radiator air valves in one-pipe jobs—for the complaint against air valves seems to be incessant where they are not of the very best quality. Those with graduated discharge ports will be opened wide for distant radiators or convectors. And recommendations will be heard that quick vent main valves be placed at the top of high risers, one more help in speeding up steam circulation. Of course it is very important that basement mains be well equipped with quick vent air valves. Less frequently will it be suggested that a one-pipe system be made two-pipe in part. It is a practicality which should be kept in mind.

Some distant one-pipe radiators on upper floors may be provided with thermostatic return traps at one end, the traps to serve principally as air vents for quick and easy steam circulation. It would be in effect an air-line system with larger piping to assure freedom from obstructions. But condensation would probably get down the return lines, too, and would have to be returned to the boiler. Again without intending to go into particulars, it could mean an automatic boiler return trap, a small receiver with float controlled return pump, or ample pressure heads in high return risers. A large air eliminator would be installed somewhere in the return piping. But the big purpose would be to have the owners realize just how superior a two-pipe system can be, so that full modernization would be ordered eventually.

Riser Drips

There are also numerous instances where steam risers need dependable drip traps at the bottom. Some have thermostatic traps which were too small from the first and hardly of the right type. They probably should be not less than ¾-in. in size and of the float model which combines thermostatic air relief. In all likelihood they never operated properly and the condition went unnoticed, for it is usually possible for the condensation to back out of a riser in the one-pipe manner. In the meantime the systems have been wasteful, slower to heat and undoubtedly noisy from water hammer. The transportation of the heat has been seriously impeded. The bottoms of steam risers in larger jobs are likely to be well flooded when a cooled-down system has steam turned into it at the start of a heating-up period. One outstanding heating engineer has reported an instance of an institution which was eventually equipped with over three dozen float type combination drip traps on risers, and records revealed later that over 700 tons of coal annually had been saved. The saving in coal consumed reached the striking figure of almost twenty tons for each trap installed.

The secret of steam heating efficiency seems to be in keeping the lines as dry as possible by thorough draining and trapping and at the same time clearing out all air. The presence of considerable condensate in steam lines causes water hammer and probable damage to piping or appliances, while at the same time it produces more condensate because it is at a lower temperature than the steam coming in contact with it. That is really what had happened in the building just mentioned, where the addition of good traps had proved so highly beneficial. But the traps also make sure of the full utilization of the latent steam heat in radiators, convectors, unit heaters, coils and similar heating members, for the traps in proper working order are closed against the passage of steam and opened only when some condensate has collected. In great numbers of industrial processes with steam usually at high pressure the traps are miracle workers in matters of efficiency and production economy, but essential industries have had no great difficulties in securing needed traps or replacements.

Value of Good Traps

One of the greatest contributions of steam traps to fuel economies is that they permit very low operating pressures. This is usually in conjunction with return line systems having vacuum pumps, but it is true also of installations that may not have pumps. Where there are no vacuum pumps, the systems still have the big facility of the two-pipe design and the added benefit of quick air-venting through the comparatively huge outlet ports of the radiator or drip traps, huge in comparison with the tiny vent holes in usual one-pipe air valves. The two-pipe "trackage" helps to speed the heat to its stations; the tracks should be clear of any condensation returning against the flow of steam. As a general statement there is no condensation return problem at all; it makes little difference if some collections of condensate are held up near traps or in cooling legs. But there may be no such holdups on one-pipe work, for that would mean pockets and obstructed steam circulation and intolerable water hammer and noises. In a word, the steam systems properly equipped with radiator and drip traps are rendering noted service in the transporting of heat, with tracks cleared of condensate and air blocks. The immediate point is that great numbers of larger buildings are again facing a new winter during a trying period and their owners may not be aware of needless losses and deficiencies. Heating men can aid in pointing this out.

Trap Inspection

As for steam systems which seem to be properly equipped with traps and controls, it is a question

whether there have been any regular schedules of inspection and repair. The rule is that it has been neglected. Traps should be regularly cleaned, of course, and inspected for possible damage such as due to corrosive boiler feed water or to having been installed where freezing was possible. Fortunately for all hands, the industry has been able to provide Victory replacement models and all regular renew parts, but the installing side of the trade has not been careful enough in providing strainers. When steam traps are kept in good condition, laboratory tests have shown them to be about 99 per cent efficient. They will pass all air and water with practically no steam loss.

It should be part of the heating system survey to look for locations where added steam traps would prove an economy. It occurs sometimes in the case of heating coils where some areas may not be properly vented; but the need for extra bleed traps will be found more often at various points along lengthy steam mains, remembering that the presence of condensate actually causes added condensation. And that, of course, is one reason why mains are well insulated. On the point of bleeder traps, it will be found that many long neglected ones are not only in worn out condition but also should have been made at least one size larger from the first.

Zoning

The possibilities of zoning the heat distribution system are always an important consideration. In many buildings already completed the immediate opportunities of the kind will embrace separate supply mains and shut-off valves for sections which may well be cut off overnight and over weekends. This applies to sections having stores, shops or offices. The ordinary valves required would be only a few gates and checks; but the work may be important enough to require motorized shut-off units and controls. In some instances it would be a matter of cutting off most of the main building during off-heat hours while 24-hr supply could be maintained for sections requiring it, such as restaurants, shipping rooms, and the like.

Every experienced heating man is aware of the great fuel waste in the numerous instances of overheated or uncontrolled domestic hot water supply. Part of recent difficulties has been due to a shortage of needed thermostatic members for replacements and that situation is probably being corrected. Certainly all storage tanks should be kept from overheating except where high temperature water is required; but on every branch line not needing very hot water the flow should be run through blenders which will keep the temperature down to the lowest that will suffice.

The principal search, however, will be for the obvious opportunities to use to good advantage the various types of steam traps, including thermostatic radiator traps, combination float and thermostatic traps, and inverted bucket traps. The inspection will hunt out the hidden traps placed in out-of-the-way locations and long forgotten. They should be fully cleaned and repaired and then made accessible.

Parachutes in Tropics Protected by Air Conditioning

One of the many vital war roles being performed by modern air conditioning is the drying and storage of parachutes, illustrated by the drying equipment installed recently by Carrier in a parachute drying tower located in the Republic of Panama.

Parachutists in training at the air base frequently land in marshy or swampy terrain or even in the sea and it is imperative that their parachutes be immediately washed and dried to prevent deterioration.

The drying tower consists of two sections. In one, 30,000 cfm of heated air and 100,000 cfm of outside air enter through nozzles on the ceiling and blow vertically downward over the 'chutes which are suspended from the ceiling. The air is exhausted at floor level. After most of the free moisture (up to 25% by weight) is removed, the 'chutes are taken down and hung in the other and much larger section where the moisture content is brought to the correct value. They are then removed to large air conditioned rooms for folding, packing and storage. Three Carrier heat diffusers supply heated air to the two sections of the drying tower, while self-contained air conditioning units supply 50 tons of cooling effect for air conditioning for the folding, packing and storage rooms and for offices.

Most parachute maintenance buildings have a tower approximately 40 ft high where the parachutes are hung and fluffed out following the routine of 30 or 60 day inspection before repacking. It is important that the relative humidity within a drying tower be kept below 50% and that outside air be circulated through the tower to prevent mildew, which damages silk fabric. This may be accomplished either by using a dehumidifying unit comprising a compressor, evaporator and hot gas reheat coil with fans for air circulation or by using a heat diffusing unit.

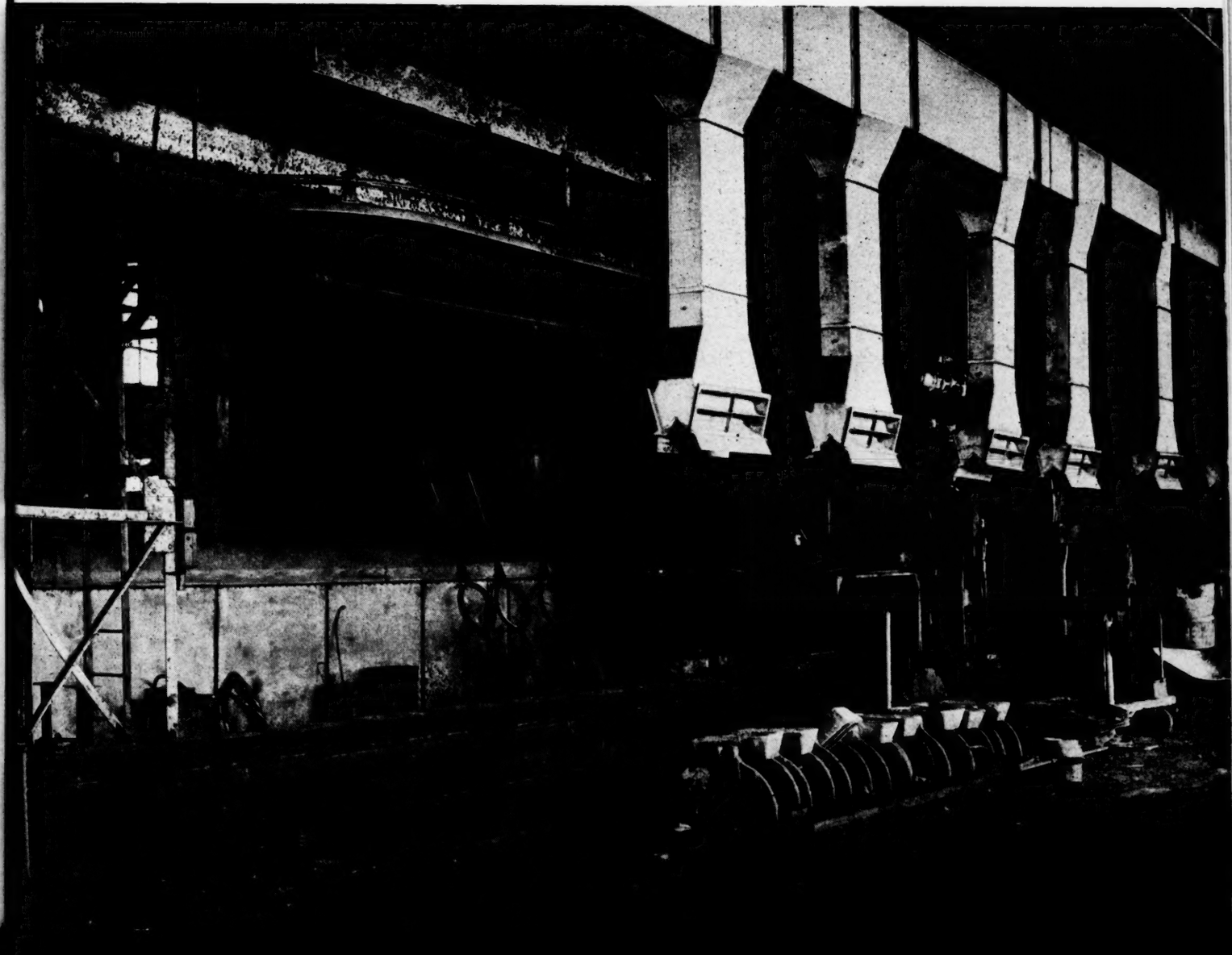
In some parachute maintenance buildings bins are provided for storing packed parachutes. This section is partitioned off from the rest of the shop and equipment is provided to keep the space ventilated and the humidity below 50%. In some cases it has been possible to install bins in a section of the drying tower and to combine the two functions in one piece of apparatus.

In some tropical work rooms, complete air conditioning has been installed to prevent dust and excessive sweating of parachute riggers, thus prevent perspiration from dripping on the 'chutes while they are being folded. In such cases, 80F DB and 50% RH are provided.

PROFITS IN AIR

HOW INDUSTRIAL PLANTS PROMOTE PROCESSES BY CONTROL OF AIR CONDITIONS

Part of the 106,000 cfm exhaust system in a Pontiac Motors Foundry.



Machine Shop Oil Mist

PROFITS IN AIR
HOW INDUSTRIAL PLANTS PROMOTE PROCESSES BY CONTROL OF AIR CONDITIONS

from coolant evaporated by modern high speed machine tools lowers efficiency of lighting equipment, increases maintenance costs. Problem is solved by electric air cleaners, in unit or group applications.†

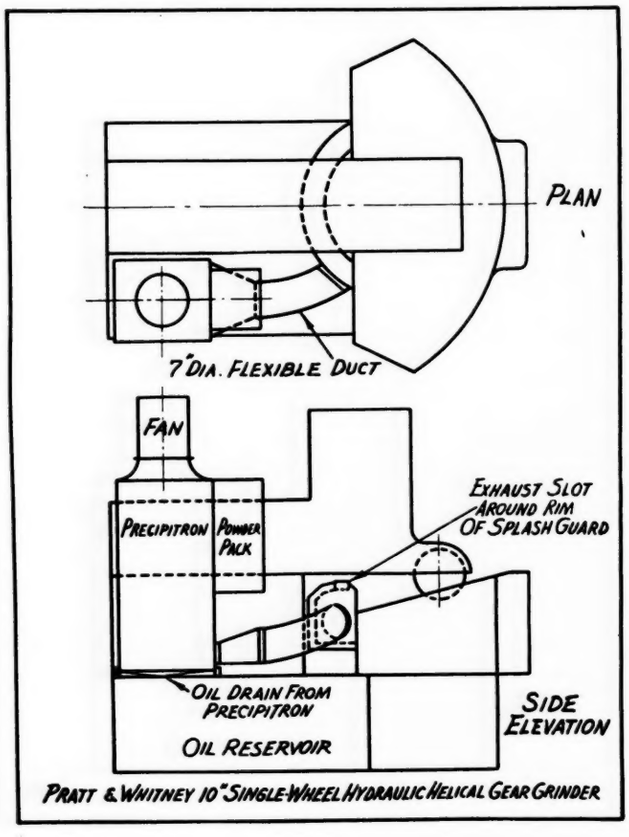
By E. H. R. PEGG

Precipitron Engineer,
Westinghouse Electric and Mfg. Co., Cleveland, Ohio

A SERIOUS problem has arisen in industry during the past few years. This problem is due to the presence in the air of certain manufacturing plants of large amounts of oil smoke and mist. It is the result of three primary factors: (1) Higher operating speeds of modern machine tools, such as automatic thread grinders and gear grinders, which cause part of the coolant oil to be broken up into a fine mist, and under some conditions part of the oil to be volatilized; (2) increase in the number of hours per day each machine is operated; (3) concentration of a large number of such machines in one manufacturing space.

Presence of oil mist and smoke in the air is a nuisance for several reasons. It lowers efficiency of lighting equipment and causes poor visibility. In severe cases it fogs the room and makes an unpleasant atmosphere in which to work. It condenses and settles out of the air to collect on everything in the space such as floors, walls, overhead structures, lighting fixtures and bus ducts with the result that maintenance costs are greatly increased. In addition to the nuisance, a real fire hazard is presented due to damage to electrical insulation and to presence of oil on all parts of the building. This is particularly true in buildings of wood construction.*

This problem can be overcome to some extent by simple ventilation alone—that is, dilution of the room air with large volumes of outside air. This, however, is prohibitively expensive because the large amount of outside air required causes excessive heat loss in winter and [in air conditioned buildings] refrigeration loss in summer. Then, too, in most localities, unless the outside air is electrically cleaned, a large amount of dirt and dust will be taken into the building. The solution of the problem



†Abstracted from a paper presented at the Machine Tool Forum, held at Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa., April 6, 1943.

*Two additional disadvantages resulting from this nuisance and mentioned from the floor in the discussion on Mr. Pegg's paper are: (1) The health hazard due to the quantities of coolant mist breathed by the workers, and (2) the condensing of this vapor and mist on tools and instruments, making them difficult to use and read.—*Editor*

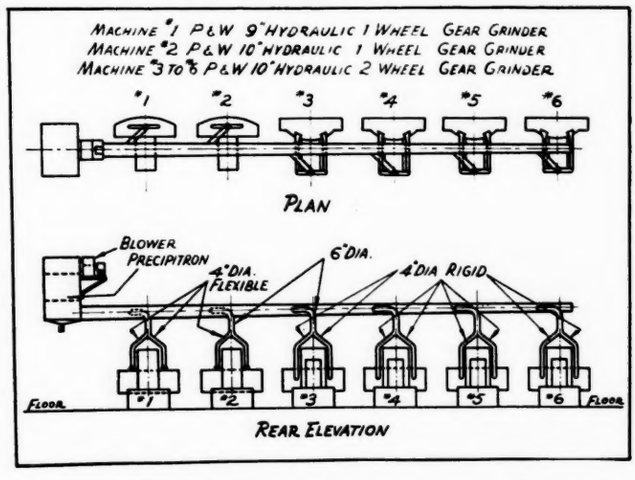

MACHINE #1 P&W 9" HYDRAULIC 1 WHEEL GEAR GRINDER
MACHINE #2 P&W 10" HYDRAULIC 1 WHEEL GEAR GRINDER
MACHINE #3 TO #6 P&W 10" HYDRAULIC 2 WHEEL GEAR GRINDER
#1 #2 #3 #4 #5 #6
PLAN
BLOWER PRECIPITRON
4" DIA. FLEXIBLE
6" DIA.
4" DIA RIGID
FLOOR
FLOOR
REAR ELEVATION

Fig. 1. (Left) Diagram of electrostatic air cleaner connected to Pratt & Whitney 10 in. hydraulic helical gear grinder. Fig. 2. (Above) Diagram of battery of six gear grinders from which oil mist is removed through an overhead duct ventilating system. Compare with Fig. 1, with individual unit.

is provided by the Precipitron electric air cleaner. The high efficiency of electric air cleaning permits air so cleaned to be recirculated within the room.

Application of Precipitron

One method of applying electric air cleaning to the problem of oil mist and smoke removal is the central air conditioning system. High efficiency of the electrostatic cleaner permits use of a larger percentage of recirculated air with only a minimum of outside air. This method is highly satisfactory in keeping the concentration of oil mist and smoke so low that no visible haze is present in the room. It has one disadvantage, however, in that the oil mist must travel through the room in order to get to the openings of the return air ducts. In doing so, it can still condense or settle on surfaces and fixtures in the room.

The ultimate solution is the elimination of the mist and smoke at their source. This is done through ventilation of the machines themselves by providing hoods and exhaust ducts to pick up the mist and smoke before it can be spread into the room air.

In either system the air is taken from the machine, cleaned and returned to the room at the same temperature. Thus there is no heat or refrigeration loss. The coolant which is removed from the air is collected by the Precipitron as a liquid and continuously runs back to the machine to be used again. In one case a small unit at one machine collected 4½ gallons of oil in 24 hours. The average, however, is something like 1½ to 2 gallons of oil in 24 hours. When we visualize this much oil being dispersed into a room from each of perhaps 50 machines in a single room, it is easy to understand why oil is dripping from lighting fixtures and other overhead objects.

All applications of electric air cleaning for the ventilation of machine tools to date have been made on machines already in use. This involves the use of sheet metal hoods and ducts and a separate housing for the air cleaning equipment.

In many types of machine tools it would be possible to design the machines to incorporate the ventilating system and electric air cleaner within the housing of the machine. This will require close cooperation between the manufacturers of machine tools and the manufacturers of electric air cleaners.

Industrial Lockers

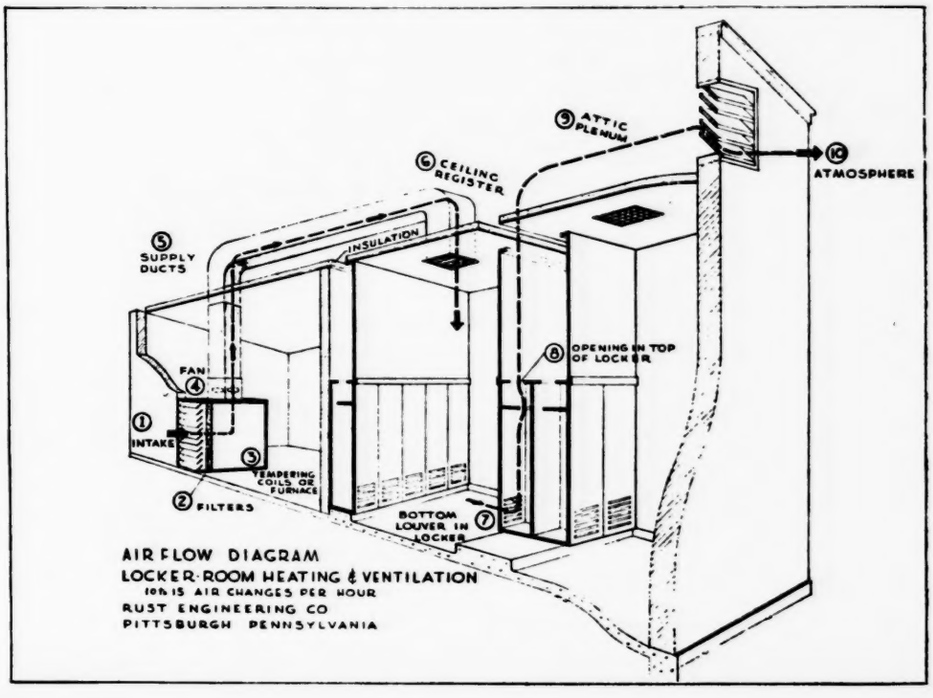
ventilated to dry workers' clothes; scheme uses glass block room

Locker rooms planned to provide for complete drying of workers' clothes, while hanging within ventilated locker cabinets, are being installed in several large industrial plants designed and now under construction by The Rust Engineering Co., Pittsburgh.

Purpose is to effect a modern solution for drying, between shifts, of workers' clothes which become saturated with perspiration owing to extreme heat conditions. The conventional method is to place the clothing on racks or baskets which are elevated to the ceiling on a pulley arrangement and locked in place.

The arrangement devised by The Rust Co. utilizes an airtight room (glass block is used in the instances under construction) in which air pressure is maintained above normal. Air is forced into this room through ceiling grilles by the fan in the equipment room of the wash and locker building.

The only exit provided for the air is through louvers in the bottoms of all lockers, which are of wood construction. Forced through these louvers, the air is drawn through the lockers into plenum chambers set on the locker tops. From here it is vented to the outside.



Modern Stokers Due to Research, Well Designed for Current Demand

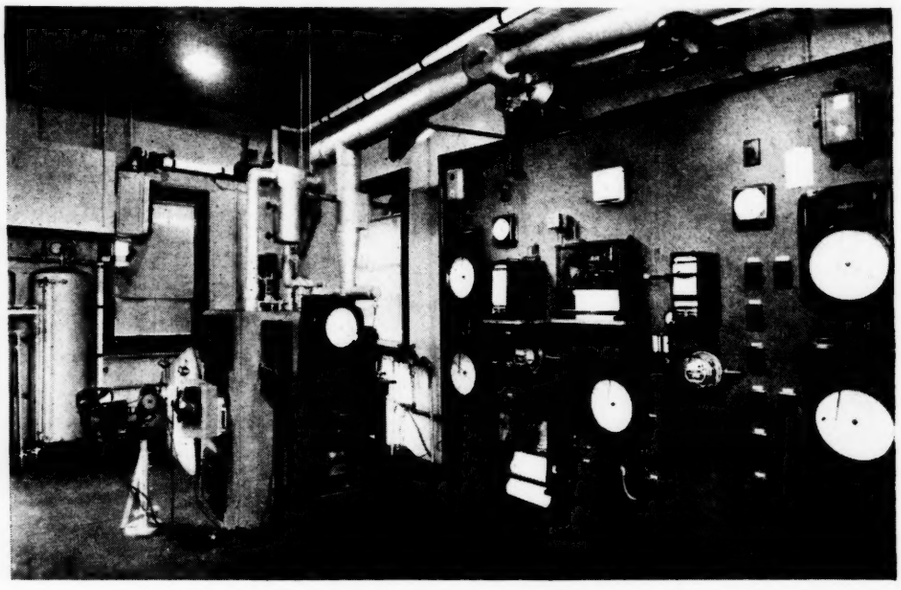
By T. F. J. MOFFETT

THE manufacture and installation of Class A stokers will continue an outstanding trade activity for some time ahead. It is due, of course, to the urgency of the fuel oil situation as well as to the peak demands on current production schedules in many war plants. Yet stokers are by no means merely replacement or conversion equipment for fuels other than coal. They regularly have beem employed in the production of a large part of the nation's power, and even before the war were gaining wide acceptance by the engineering profession and by the general public. Building owners and heating engineers may not be fully aware that stoker sales jumped from 12,500 in 1931 up to 200,000 units in 1941, an increase notable because of its occurrence in a market where burners of other fuels were in full and free competition.

From the standpoint of the consulting engineer, stokers are equipment which can take full advantage of the nation's almost inexhaustible supplies of hard, soft and lignite coals found in at least thirty states, burning the lowest grades very efficiently and without smoke, and actually increasing the rated capacity of hand-fired boilers. At the same time stokers sometimes use less coal and thus save storage space, transportation and handling. They will do the firing job more efficiently than any human fireman. And although the stokered fire needs some manual attention, the stoker usually will release man-power for considerable periods for other duties in a great many industrial or commercial plants.

Many engineers, heating contractors and building managers are showing special interest this year in stokers, knowing that stokers provide a very satisfactory form of automatic firing and use the smaller sizes of coal which might otherwise be wasted. It will be no news to them that many so-called stoker complaints are caused by improper stoker installations rather than by any inherent defects in the design of the appliances. Further, they are probably familiar with such statistics as the following, issued recently by Office of Defense Transporation, showing that in one section, New England, anthracite requirements for 1943 are expected to exceed substantially the 1942 deliveries of over seven million tons, and that the bituminous requirements for the same territory are estimated at 27 million as compared with 1942 deliveries of a little more than 23 million tons. Where millions of tons of coal are involved, it follows that careful firing is a conservation matter of great national importance.

Qualified heating men are aware, too, however, that even though a stoker may increase the load carrying capacity of a boiler, particularly a steel boiler, it will rarely correct certain inherent faults in a deficient heating system. If the defect was due mostly to insufficient steam pressure or hot water temperature, the stoker may prove to be a remedy; but usually the heating system requires independent study and correction of piping, valves and controls. The increased boiler capacity will pay dividends rather by a decreased fuel cost per pound of steam, or by taking care of an added wing or story of the building. One good example is that in which two stories were added to a six-story building, but no changes were required at the heating boilers except



View of a stoker coal research laboratory, showing some of the apparatus and instruments by which thorough-going analyses are made of the performance of stoker coals. Photos courtesy Koppers Company Research Department.

Two typical views of well-adjusted stoker fires. The photographs were taken with the camera pointed through the firing doors of small domestic boilers.

the installation of stokers in place of hand firing.

The fact that stokers consume the smaller sizes of coal—the grade being the same as the larger sizes —means, of course, that the price per ton is lower. This saving is so considerable that, according to one authority in the heating field, there are numerous known cases where a stoker saved its own cost annually in plants using 800 tons or more per boiler per year. As for increased boiler rating, it is reported that properly installed and properly sized stokers will develop at least 25% greater steam output in existing hand-fired boilers. On the point of labor saving, Marc G. Bluth, secretary of the Stoker Manufacturers' Association, wrote in a report prepared at government request: "The shortage of man-power is perhaps the most vital problem today. Stokers save thousands of man-hours daily by reducing the labor necessary to operate many thousands of heating, power and processing plants, thereby releasing this man-power for work in war plants and for service in the armed forces. In countless plants boiler room personnel is released part-time for maintenance and other essential work.

Good Design Important

Laboratory research and experimentation have gone hand in hand with stoker development. Every step forward in research has usually meant some added stoker refinement. Certain overall principles of design for underfeed bituminous stokers are now generally recognized. Some of these are explained in a bulletin by Walter Knox, Director of Koppers Stoker Coal Research Laboratory, Kearny, N. J. For instance, the correctly designed stoker requires very little power to convey the coal by worm through the feed pipe from the hopper. On an ordinary domestic stoker it should be possible fairly easily to turn the worm under firing conditions with a wrench having a one-foot handle. A bin type feed will turn a little harder. The larger Class A stoker calls for more power, of course, but it should be relatively of small proportions.

Where the stoker design is correct—and the basic points are now generally accepted by the manufacturers—the coal load in the underfeed stoker will usually be concentrated in two places. The first will be where the coal breaks from the hopper or bin into the coal tube; and the second where the coal is pushed up into the fuel bed in the retort. A correct design will have the coal moving so loosely through the tube that very little power is necessary. It is explained also that good design takes care of the fact that a feed worm will ordinarily bring up more coal than can be carried away in a coal tube—that is, where the length of the worm exposed to the coal in hopper or bin is 15 in. or so. The result, if uncorrected, would be the crushing of coal and the consumption of extra power. Evidence of this crushing is sometimes seen where pulverized coal is pushed up above the entrance of the coal tube. However, the manufacturers have taken various steps to correct this condition.

Tapered Feed Screws

One common method is to taper the exposed feed screw in the bin or hopper, diminishing the diameter progressively away from the coal tube entrance. Sometimes the screw diameter is cut down in one step, in which case a few inches of full diameter screw will be left exposed out from the spike trap. The rest of the screw will be of a much smaller diameter.

Another method used to control the volume of coal brought to the tube entrance is to cover part of the screw. Ordinarily the hopper has a formed or cast base to fit the diameter of the feed screw, which usually means that from two-thirds to three-quarters of screw diameter is exposed to the coal. A remedy sometimes employed is to cover more of the diameter of the screw at its sides so as to decrease the flow of coal. It is believed, however, that the tapered feed screw end is the more effective arrangement, and sometimes service men cut a decided taper on a feed screw that has been bringing up too much coal.

Spike Traps

Most stokers include a spike trap at the entrance to the coal tube. It is fundamentally a device for

catching foreign material and providing a means for removing it. Many manufacturers make the spike trap perform another equally important function, however, the metering or limiting of the amount of coal going into the tube. Since the spike trap must be at the entrance of the coal tube, it generally forms part of the entrance. Owing to the restriction of the trap, the coal may be packed fairly tight as it passes under it. But as the coal passes into the rest of the tube it will loosen up because of the greater area. The spike trap generally is on top of the tube and might be lifted higher by use of gaskets or washers, but it should not be raised by servicemen for the purpose of lessening the packing and crushing of the coal. The purpose of the arrangement is to provide entrance at what might be called the small end of a funnel for the coal.

Variable Pitch Screws

Restricting the flow of coal at the spike trap, however, may be insufficient under some conditions to entirely eliminate packing of the coal in the tube and other supplementary methods are often used. One is to increase progressively the diameter of the coal tube from the spike trap to the retort. This is allowable in the hopper models and can be done easily with cast materials, but where the longer bin feeds and stock steel tubing are used a variable pitch feed screw serves the purpose more easily. A variable pitch screw is explained as one that does not have a constant pitch, or distance between threads, along its axis. Common practice is to use a short distance between threads in the hopper or bin and for a short way into the coal tube. Then the rest of the feed screw within the tube will be given a greater distance between the threads. This cuts down the amount of coal fed into the tube, and after the coal has passed the entrance it is loosened as it gets to that part of the worm of greater pitch.

The effect of this device is that the coal makes no appreciable load in the tube, but when it reaches the retort it must be pushed up and the load consequently increases. Thus the shape and slope of the retort have a great deal to do with the ease with which this is accomplished. Its cross-sectional area must be of constantly increasing dimensions. It will be part of the servicing to be sure there are no clinkers sticking to the inside of the retort.

With the smaller domestic retorts the feed screw will end usually at about the entrance into the retort. On the larger machines, however, the screw protrudes some distance into the retort. The exact position of the end of the screw in the longer retort will be governed by its influence on distribution and segregation of the coal as well as the power used. It will protrude as a rule a distance of approximately one-third the length of the inside of the retort.

Control of Gas and Smoke Leakage

There also has been close study of design methods to control "smoke back." The tendency for smoke and coal gas to come back through the feed tube and into the hopper is partially dependent upon the type of coal. Low volatile, oil-treated coals, properly sized, seldom give this trouble. Poorly sized and dusty coals are often bad offenders. Also there are coals with ash characteristics such that the best of stoker designs will not stop smoke back. Thus the obvious and most generally used method of lessening a smoke or gas backflow is to put some air pressure inside the coal tube. Small holes or slots are cut in the top of the tube generally within a few inches of the retort. In other designs air is brought to these holes by a separate pipe or conduit. In this case air is sometimes brought directly from the fan outlet with the objective of getting maximum pressure. In designs having no separate pipe to the air holes the air supply comes from the surrounding windbox or air chamber. If the holes are small enough and correctly placed there is very little tendency for coal to work through them or fill them up. The manufacturers, moreover, provide a variety of methods of inspecting and cleaning these holes.

It will be remarked that if air is put directly into the coal tube, some of it will be likely to work back into the hopper. That is one reason why manufacturers try to keep the coal packed in at least one part of the tube, usually under the spike trap. Still there is always a chance that some smoke or coal dust will come back into the hopper and it is therefore general practice with domestic stokers particularly to seal the hopper so that no smoke will get out into the basement. Some designers have gone a step further and have put some air pressure into the hopper. Others vent the hopper to the fan inlet so that any escaping gases are drawn back through the fan.

It follows as a part of good stoker design that the tuyere ports in the retort should be made so as to give proper air distribution and also to let as little as possible fine coal and ashes down into the windbox below.

Depth of Fuel Bed

Authorities in the field would have us remember that the depth of the stoker fuel bed is an important matter. The fire may burn down into the retort if it is too thin and damage the retort sides. But poor air distribution may result if the fuel bed is too heavy, causing a spotty fire, blow-holes, smoke and reduced efficiency. The correct depth of the fuel bed, according to The Combustion Engineering Co., may be anywhere from 4 to 8 in. above the top of the retort, this depending on the burning characteristics of the coal used.

Another recommendation is that a draft gauge and CO_2 indicator be used. The draft above the fuel bed should be slight because pressures above 0.10 in. will cause excessive temperatures at grates and at the lower furnace wall areas. Forcing a stoker beyond the capacity of the stack to carry away gases is also a bad practice. It has been found that the two main causes of boiler outage and stoker maintenance are (1) sustained or recurring overloading of the stoker and (2) operating with insufficient draft.

How to Design Exhaust Hoods

By J. M. DALLA VALLE

Engineer and Consultant,
Kruse Engineering Co.,
Newark, N. J.

Part 5—Hoods for Dust Control: Total Enclosures and Screening

THE air velocity at a given source is determined by the characteristics of the process. In the case of dust, the friction created on the surfaces of the particles by the moving air must be sufficient to overcome the force with which the particles are thrown off. This force is a function of the size, shape, and weight of the particles and their speed of travel. Heavy particles require a higher air velocity than light ones.

Ordinarily, the directional forces acting to produce a dust cloud are easily determined. Grinding wheels throw off the dust in a well-defined direction. This fact should be utilized in shaping and locating the hood, since it has an important bearing on the strength of the air stream required.

Knowledge of dust source characteristics often results in economical designs. Complete or partial enclosure of the point of dust generation offers an effective means of reducing the air velocity requirement. The travel speed of the dust particles may be reduced and their direction changed by the proper location of baffles or housings. This phase of hood design is limited chiefly to processes not requiring close attention of the operator or delicate manipulation. The trap for use with rock-drills is an example of complete enclosure; the application of partial enclosure is illustrated by the hood used on granite surfacing machines. Many examples of partial and complete enclosure are found in the wood-working industry.

Each process must be carefully studied and every possible step taken to reduce the air velocity required to capture the dust. In general no other phase of hood design gives as great a saving in operating cost as reduction in the required air speed.

No extensive classification of hoods for dust control is necessary. These hoods fall into two broad classes, namely, those which enclose a dusty operation completely and those which act as partial barriers. Use of either type is based almost always upon the character of the work performed. Where infrequent inspection of the operation is the rule, or where ease of access to parts is not essential, enclosures may be complete. Conversely, where constant attention or labor must be performed, the dust sources at best can be enclosed only partially.

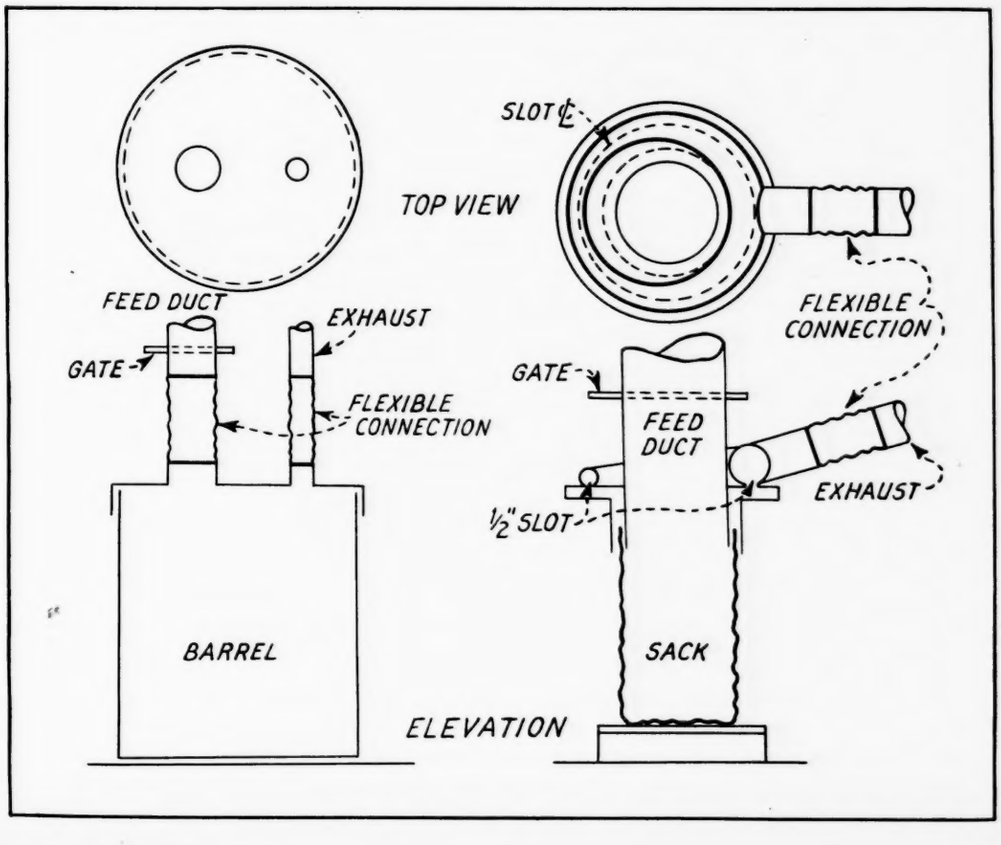


Fig. 37 Dust control for barrel and bag filling.

TABLE 10.—STATIC SUCTION IN MANIFOLD FOR A FLOW OF 60 CFM AND DIFFERENT LENGTHS OF 2-IN. FLEXIBLE HOSE; DRILLS OPERATING

Hose Length (Ft.)	Static Suction in Manifold (In. H_2O)
25	3.5
50	7.0
75	10.5
100	14.0

TABLE 11.—AIR VOLUME REQUIREMENTS FOR CYLINDRICAL SCREENS

Largest Diameter (Inches)	Air Volume to be Exhausted (Cfm)
29	2500
30-49	4000
50-59	5000
60	7500

It is fundamental to the operation of exhaust systems that all totally-enclosed equipment must be provided with sufficient air so that the dust collected can be conveyed without settling in the duct work. There is no object in designing large duct work merely to provide an inward leakage, but it should be borne in mind that wherever moving parts are hooded no accumulation of waste should be tolerated. Hence, it is good practice in such cases to provide air inlets at vantage points and to provide ducts of the proper size so that the air volumes handled will remove all dust. It must be held in mind that the methods of dust control discussed here are not considered applicable to every dust problem. As pointed out, no two plants produce dust in the same way, and what may prove practical under one set of circumstances may be cumbersome in another. No method of exhaust to control dust is useful if it impedes the worker or consumes too much time in making adjustments. In such cases, other methods must be sought to control the dust. Every problem of dust control should be subjected to careful study, not only as to effectiveness of the equipment designed, but also from the standpoint of encumbrance.

Barrelling and bagging. The loading of barrels and bags with finely-divided matter produces large quantities of dust. This dust is caused by impact and air displacement. Methods used for control are indicated in Fig. 37. In the case of barrel loading, a flanged cover is used. This is suspended from the feed and exhaust ducts by the flexible connections shown in Fig. 37. Dust generated in barrel filling can be controlled by exhausting 70 cfm.

In recent years, bag filling has been done by automatic equipment which does not require constant attention. Bag filling operations have been conducted so efficiently that often the dust problem is not serious. However, there are instances where exhaust has been applied. As a rule, ventilation is provided at the rear of the bagging equipment, but close to the top of the bag. The air is thus made to pass across the region of dust generation. Exhaust grilles which reduce the accumulation of settled or spilled material are also to be found.

In the small plants, employing manual methods of bagging, an exhaust system similar to that shown in Fig. 37 is used. This method is better adapted for filling paper sacks which are fitted about the duct leading from the hopper. Wherever possible, the exhaust fitted to the feed duct should be movable to allow accessibility in placing the sack. Exhaust ventilation amounting to 50 cfm has been found effective in controlling the dust. Duct velocities for both barrel and sack loading should be at least 4000 feet per minute.

Rock drilling. In order to cope with the dust produced in rock drilling, particularly in foundation and tunnel work, special dust traps have been devised.[9] In form these traps are similar to the Hay trap, with the exception that the latter utilizes an ejector connected to the drill exhaust, while the new devices are connected to powerful exhaust fans.

The essential requirements of a dust trap for rock drilling have been carefully investigated. Fig. 38 shows the type of trap investigated in connection with downward drilling operations in foundation work. The drill is inserted in a hole at the top and the exhaust applied at the 2-in. connection indicated. About 60 cfm of air are required to maintain a low dust concentration, the air passing along the uneven surface of the rock and through the drill hole, thus making an air trap. The dust collected passes through the exhaust ducts to a separator and bag filter of high efficiency. In actual operation, a convenient pipe-exhaust system is installed with a number of manifolds for trap connections.

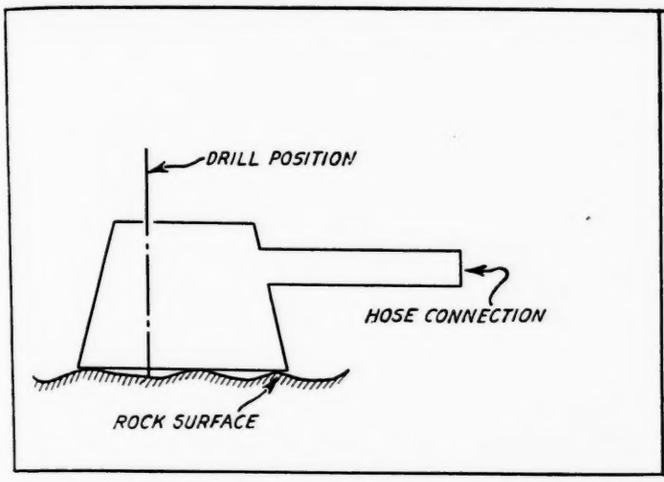
The necessary air flow of 60 cfm represents a static suction at the trap of only 0.8 in. of water. However, there is considerable loss of pressure in the hose connecting the trap with the exhaust manifold. The suction required at the manifold for hoses of various lengths has been determined and is presented in Table 10. The hose connections are an integral part of the dust trap.

In any design adequate suction must be provided at the manifold to take care of the longest lengths of hose used. It is further important to allocate the manifolds at the most advantageous points to take care of drilling operation progress.

For vertical or horizontal drilling, special adapters (shown in Fig. 39) have been developed for placing the trap in any position.[10] Under such circumstances

[9]Theodore Hatch, George S. Kelley, and J. W. Fehnel, 1932. Control of the silicosis hazard in the hard-rock industries. II. An investigation of the Kelley dust trap for use with pneumatic rock drills of the jack-hammer type. Journal of Industrial Hygiene & Toxicology, 14:69-79, 246-254.

[10]Theodore Hatch, H. Warren and George S. Kelley, 1933. Control of the silicosis hazard in the hard-rock industries. IV. Application of the Kelley trap to underground drilling operations, Journal of Industrial Hygiene & Toxioclogy, 15:41-56.



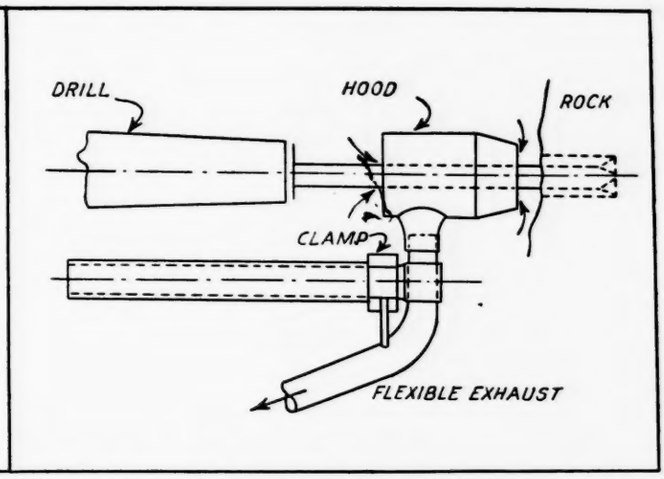


Fig. 38 (Left) Dust trap for downward rock drilling. Fig. 39 (Right) Dust trap for horizontal rock drilling.

air flows of the order 200 cfm have been recommended to keep the dust concentration below 10 million particles per cubic foot.

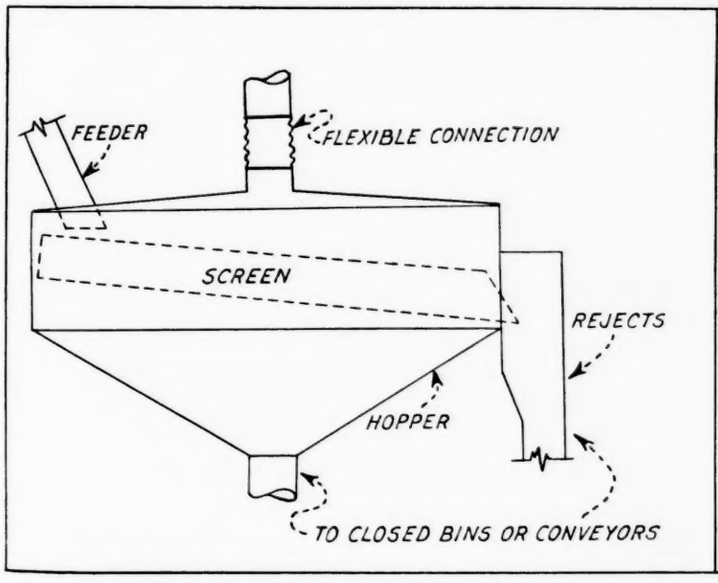
Since the improvement in wet-drill methods during recent years, dust traps have not proved practical. However, there are certain minerals, such as talc, in the mining of which it is not feasible to use wet methods, so that the trap remains the best method of controlling dust during drilling operations. It is interesting to point out that in test core drilling the dust collected by trap devices not only aids in increasing the rate of drilling but also permits the collection of samples at various depths in suitable form for petrographic or chemical analysis.

Flat deck screening. The requirements for designs used in screening operations depend largely upon the size of material to be handled. The air volumes used to control dust should not be so high that material is carried off from the screen hopper or the screen surface. Flat-deck screens should be totally enclosed, as shown in Fig. 40. The enclosure should be connected with a source of suction which will cause an inward flow of air and thus restrain the fines from escaping into the surrounding air. It is generally preferable to equip the exhaust system used with a suitable means of collecting the dust conveyed within the ducts. Seventy-five cubic feet per minute per square foot of screen area are recommended, but not less than 200 feet per minute through inspection openings, for sand screens commonly found in foundries.[11] Calculation of open area through which air will pass offers certain difficulties and it is customary to require 1¼ inches of static suction at the connection to the screen.

It is advisable to provide openings at various points to permit the entrance of air, unless there is enough leakage to supply the air required for exhausting the dust; wherever the screen is enclosed so that there can be no escape of dust (except at inspection openings), both the air volume handled and the exhaust duct may be reduced.

Cylindrical screening. As a general rule, cylindrical screens are equipped with tight enclosures. The air volume depends to a large extent upon the

[11]Kane, John M., 1938. Exhaust requirements for foundry dust control. The Foundry, 66: Jan. 30-32, 74; Feb. 31, 72, 74.



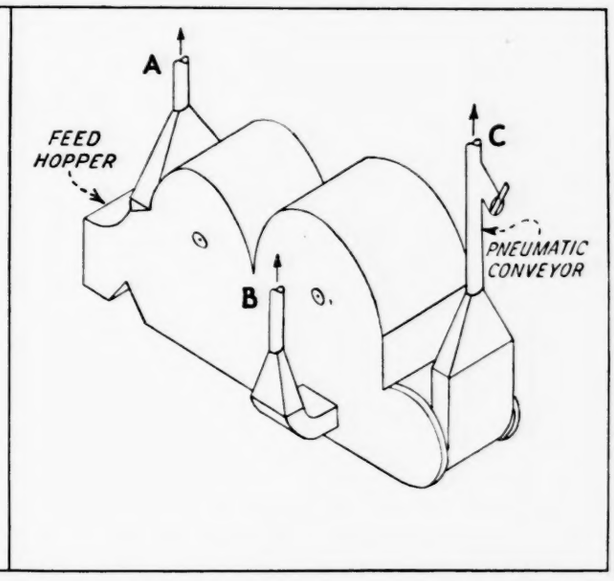


Fig. 40 (Left) Enclosure for flat deck screen. Fig. 41 (Right) Enclosure for control of dust asbestos carding machine.

opening areas provided, and whether or not the fines are to be conveyed to a suitable point of disposal. The data given in Table 11 apply to cylindrical sand screens, but are also useful for other screening operations. Where fines are to be conveyed by the exhaust system, openings should be spaced so that the air flow is directed to obtain a maximum efficiency of collection.

In all screening operations, it must be remembered that the problem of dust control is not necessarily limited to the screens themselves, but also to chutes, hoppers, and loaders, as well. Frequently dust which appears to be generated by the screens may be due to other parts of the general system. Nevertheless, screen hoods which are subject to vibration as well as the surroundings in which the equipment is placed, should always be kept clean.

Asbestos opening. Asbestos opening consists chiefly in separating crushed asbestos fiber preparatory to mixing with cotton. The work produces large quantities of asbestos dust, which is known to be injurious to health. The equipment, as shown schematically in Fig. 41, is totally enclosed except at the feed hopper and at various points near the floor on the opposite side.[12]

Hood A exhausts the feed hopper, hood B removes the settled dust or bottom fly, while hood C acts as a conveyor and transports the asbestos which has passed through the machine to a cyclone. The following air volumes handled by the hoods were found to reduce the dust concentration to a safe limit: Hoods A and B, each 400 cfm; hood C, 1800 cfm. The last-mentioned hood, as has been stated, is for the purpose of conveying the asbestos as it leaves the opener. Its successful operation requires an adequate inflow of air to effect the transport of the material. It also functions in removing dust generated during the opening process.

Blast cleaning. Blast cleaning rooms, as a rule, are constructed of heavy metal plate. In modern type rooms, air is allowed to enter through the ceiling and is exhausted through metal ducts in the sides of the room at the floor level. The material to be cleaned is brought into the room either on a revolving table, by cars, or monorail. When the doors of the workroom are closed the operator, to protect himself from the impact of the abrasive and also to prevent inhalation of excessive dust, places a respirator or cloth over his nose and mouth, and some form of canvas helmet over his head. In some cases, positive air-pressure helmets are used. These are provided with a supply of fresh air obtained outside the blast cleaning room and delivered to the helmet under pressure. It is also necessary for the worker to wear heavy gloves to protect his hands from impact of the abrasive, and at times he wears canvas leggings and shoes provided with metal toe caps as protection for legs and feet. With the blast hose in hand, he directs the abrasive stream against the surface of the work, the hose being of sufficient length to allow him freedom of movement so that he may direct the blast against any part of the work.

Exhaust ventilation alone is not sufficient to remove dust during blast cleaning operations. It is necessary for all workmen within a booth to be provided with approved types of positive pressure helmets supplied with clear air. Air exhausted from blast cleaning rooms not only prevents dust from escaping outward, but also helps to increase visibility and reduces the air required to keep dust from entering the helmet. It has been shown that as the dust concentration increases in a booth, more air must be fed to a helmet.[13]

From 1 to 5 air changes per minute are used in blast cleaning rooms. Air enters through louvered parts in the ceiling and leaves at openings near the

[12] U. S. Public Health Service, 1938. A study of asbestosis in the asbestos textile industry; W. C. Dreessen, J. M. Dalla Valle, T. I. Edwards, J. W. Miller, and R. R. Sayers. Bulletin 241.

[13] U. S. Public Health Service, 1935. The determination and control of industrial dust. J. J. Bloomfield and J. M. Dalla Valle. Bulletin 217.

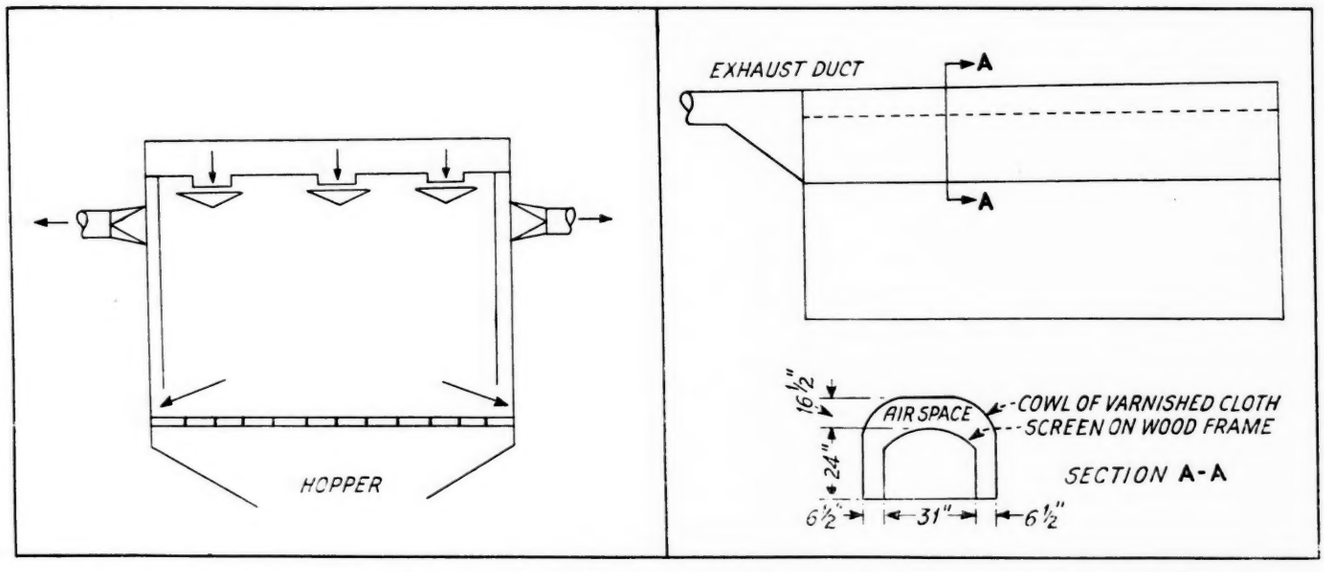


Fig. 42 (Left) Section of sand blast room. Fig. 43 (Right) Enclosure for American type fur-felt blower.

floor. These openings should be of such size that air leaves at velocities not much greater than 1000 feet per minute, to prevent the escape of abrasive material. Abrasive cleaning rooms are provided with grille-type or perforated flooring through which the abrasive falls. The hoppers below may be emptied automatically by conveyors or by pneumatic transport methods. A schematic sketch of a blast cleaning room is shown in Fig. 42.

Fur blowing. In the preparation of fur used in the manufacture of felt hats, the clipped fur is passed through a blowing machine. One form of this device, known as an American-type blower, consists of a series of cylindrical screens which are mounted horizontally and turns at high speeds. The fur, fed from one end of the machine, is whipped into the air. The finer hair is kept in suspension while the coarse material either passes into the cylindrical screen (about ½ in. mesh) or drops to the bottom of the machine. American-type blowers are equipped with stationary wire screen (¼ in. mesh) tops. This construction, used to obtain the effects of high room humidity (80%), gives rise to much dust.

To control the dust generated by the American-type blowers an almost semicircular hood, concentric with the screened top of the blower, is used. This hood is constructed of varnished cloth to reduce the weight of the blower top, which must be raised periodically for cleaning. An adapter is fitted to the feeder end of the hood and connected to an exhaust leader. Air is thus drawn from the open end across the screened top of the blower and thence to the exhaust system. Detailed dimensions of the hood used are presented in Fig. 43. The air flows employed to control the dust generated by 2-section and 6-section American-type blowers are as follows: For a 2-section blower, 1840 cfm, and for a 6-section blower, 2330 cfm. See Footnote 12.

(Next month's installment will cover partial enclosures for dust control.)

Arctic Conditions Reproduced in Army Research Laboratory for Testing Clothing and Equipment

Experiments being conducted on soldiers who are acting as volunteer guinea pigs, are providing the answers to a number of problems which have arisen, or are expected to arise, in connection with our military operations in the Aleutians, in Iceland, or in other possible frigid near-polar localities. Lt. Colonel John Talbott, recently of the Hartford Fatigue Laboratory and the Massachusetts General Hospital, is directing the tests, which are being carried on in a recently completed climatic research laboratory of the U. S. Army Quartermaster Department on the third floor of a former woolen mill building in Lawrence, Massachusetts.

The first unit of the laboratory, the cold room, is built around an old ice vault as a nucleus, which was installed some years ago for a wool degreasing process, since outmoded. The room is sufficiently insulated, and is equipped with enough refrigeration capacity, to obtain temperatures as low as —90F. It has a treadmill to provide a means of exercise for the soldiers, and the equipment also includes a fan to simulate Arctic winds, and artificial snow-makers made from atomizers.

Recordings made in Alaska last winter showed temperature readings as low as —70F, which is about as low a figure as the Army expects to encounter anywhere. However, —55F has been selected as a desirable objective for the tests, as it is felt that wearing apparel and other personal equipment designed for and tested to insure efficient field operations at this temperature, will handle the somewhat colder conditions satisfactorily, since they probably will be of a comparatively short duration. Experiments thus far have led to an overall improvement of about 50% in the efficiency of cold weather sleeping and wearing apparel.

In the designing of cold protective equipment the same basic idea is used—that of having an outer shell which is wind resistant and waterproof, and on the inside next to the skin of the wearer a light, well ventilated fabric.

The sleeping bag consists of two parts, an outer waterproof and windproof casing, and an inner or main bag, filled with eiderdown, kapok, feathers, or milkweed. The down filled bag weighs 12 lb and has the appearance of being too thin and light for such extreme temperatures, but according to Colonel Talbott, is warmer than the 15 lb of clothing a soldier wears during the daytime experiments, since during the day more body surface is exposed to the cold.

Opinions differ among the research workers on the question of wearing clothing in the sleeping bag at night. A recent expedition to Northern Canada found after ten days that those who slept only in long underwear and socks stayed warmer during the night, and consequently more rested, than those fully clothed. The socks worn are the ski type, while the "longies" are common half and half cotton and wool.

Thermocouples, about 23 in number, are attached to various parts of the garments, and to the skin of the subject, giving complete a picture of simultaneous body and clothing temperatures. Thus, typical chart recordings showed that when —12F prevails on the outside of the sleeping bag, plus 10F exists between the inner and outer bag, 78F outside the subject's underwear, and 92F on his skin, making a temperature gradient of 104F in about 3 in. of space.

LIQUID COAL FOR OIL CONVERSIONS

BY T. W. REYNOLDS

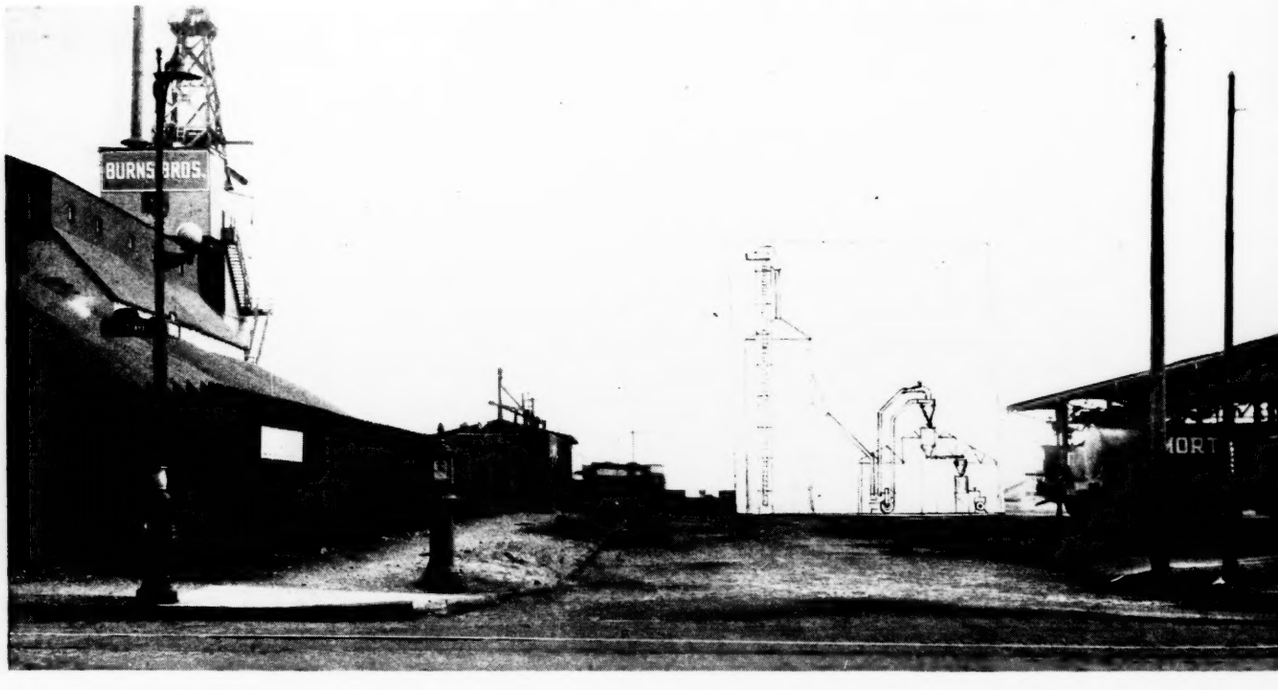
"A new industry based on the use of coal looms on the not-too-distant horizon as a virtual necessity. In its establishment I hope soon to lend an official hand. . . . One immediate consequence of the war, of vast importance to the whole bituminous coal and related industries, is the enforced conversion from fuel oil to coal, especially by large industrial consumers. There can be very little doubt that this conversion will be, for the most part, permanent. . . . There are two compelling reasons for this belief: (1) the rapid decline of petroleum resources, (2) the huge cost of conversions. In the larger plants this cost must be calculated in tens of thousands and sometimes in hundreds of thousands of dollars. . . . Colloidal fuel may be a god-send to plants with furnaces having a limited combustion space and passage for gases, and no provision for ash disposal. These conditions would make the use of solid fuel difficult, if not impossible, without rebuilding the furnace. . . . No one can deny, of course, that this petroleum reserve may be increased in time to come by the discovery of new oil fields, although our geologists long have warned that discovery could not keep pace with established consumption. On the other hand, it is equally probable that our oil resources may be depleted at a rate much more rapid than we anticipate because of the necessities of war and of possible errors in our estimates . . ." Excerpts from Harold I. Ickes' "Coal's New Horizons," which appeared in Coal Age, April, 1943.

When we turn our attention to the dominion of physical things we find that a general benefit can result from war. For example, conservation as a result of war has made us take heed of things of which we thought little or nothing in the easy times of abundance and also is making us learn how to get more and more from less and less. Twenty-three years ago powdered coal came into use during the emergency of war as a substitute fuel and gave needed increased output from industrial furnaces and steam boilers. Today with growing knowledge regarding the complexities involved in the utilization of fuels, we have with us the practical development of liquid coal, better known as colloidal fuel, a fluid fuel which can be burned as a composite of oil and finely ground coal or coal dust in existing oil burners for power generation, processing and heating.

The development of this fuel beyond the experimental stage appears to present quite some possibilities for the present as well as for post war business, increasing as it does the much needed efficiency and capacity of existing fuel burning equipment. This can be done without any change in such equipment, thus conserving on critical materials otherwise required when converting to coal, and also hastening production as there are not the delays otherwise encountered due to changes or while awaiting new coal burning equipment. There is also no decrease in capacity of boilers as is usually the case when converting to coal, in fact as stated there is on the contrary a certain amount of increase of boiler capacity. The new fuel combination possesses many of the advantages of fuel oil and may eventually become a somewhat cheaper fuel; in any event its introduction practically amounts to a large increase in the supply of fuel oil. Proximity of bituminous fields to the great industrial centers of the East also will lighten the burden for oil transportation.

Coal mining methods by the introduction of mechanical apparatus have produced more dust and dirt with the coal than when hand mining was universal. Coal mine mechanization and preparation is on the increase and as a result larger quantities of fine coal, dust and slurry can now be purchased at attractive prices; thus the new fuel makes available vast and almost unused fields of low grade coal. Low grade and waste fuel in the powdered form if burned in the colloidal state on locomotives would save the nation 10% of all coal burned and reduce the total freight traffic 5%. The railroads in the United States burn

Fig. 1. How one enterprising New York City fuel oil dealer is taking steps to retain his turing equipment is shown inserted in the left half of the photo. The



20% of all coal mined, the thermal efficiency in the pulling of cars averaging about 5%. Coal hauling represents 10% of the total freight traffic.

Conversions

Oil to coal conversions have been the order of the day, resulting in the use of a vast amount of critical material for the changes which are necessary due to the following reasons: (1) The conversion is often limited where the use of pulverized fuel is desirable, unless additional boiler capacity is added, because of the fact that the boilers when using oil ran at higher ratings than possible to secure through the use of pulverized coal alone; (2) the change to coal usually requires more combustion space and more passes for the gases than is available, and such space cannot be obtained without raising the roof or going down below floor level where water is often encountered and building footings may be undermined; (3) changes of this kind cannot be made without interfering with production as there is seldom any stand-by boiler capacity in war time industrial plants; (4) this avoidance of interference with production involves the need for additional boiler capacity, and this additional capacity usually must be at high pressure so as to pack maximum capacity into existing remaining space; and (5) such capacity of modern design requires a lot of auxiliaries together with railroad sidings, coal storage, coal and ash handling equipment and much piping so that before finis is written practically a new boiler house has been built.

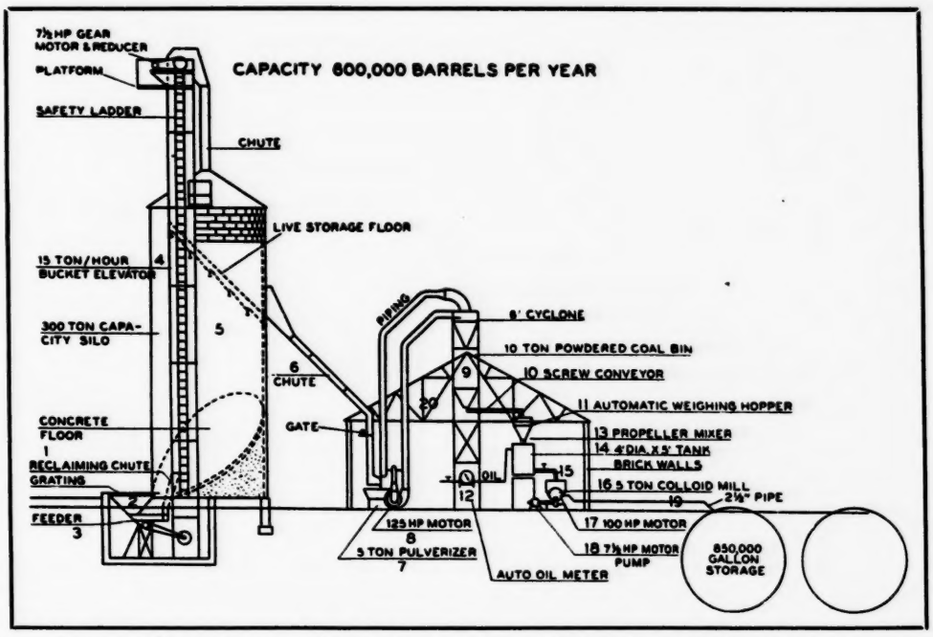


Fig. 2. Schematic operational view of the colloidal fuel making plant shown inserted in Fig. 1.

Colloidal fuel appears then to be the answer to many such cases, conserving at it does from 40 to 50% of the oil formerly used, for the fluid mixture may be varied in weight by from 40 to 50% of coal and from 60 to 50% oil.* Where the boiler plant cannot for various reasons be converted to coal, the use of colloidal fuel becomes even more imperative; for example, (1) for boiler plants which cannot be extended because of surrounding space being too valuable for other purposes; (2) where there are no facilities for ash or coal storage; (3) where the chimney is of insufficient height for fuel other than oil; or (4) where there is the objection of dust from ashes or fly ash interfering with the process.

Colloidal fuel can replace fuel oil with practically no change in storage, handling, heating or burning equipment and its controls. This feature is of value in promoting rapid conversion all over the country, as it

*Editor's Note: Petroleum Administrator Ickes recently suggested 40% coal and 60% oil as a preferred colloidal mixture.

customers by continuing to supply them with liquid fuel. New colloidal fuel manufac- capacity of the plant will be 85,000 gal per day, or 600,000 bbl per year.

eliminates practically all initial expense, thus providing an immediate trial to demonstrate whether or not the substitue fuel is adequate for the service. Another point is that colloidal fuel might be used temporarily until straight coal burning equipment could be secured. There are also further advantages such as freedom from fly ash and dust and the burning of a smoky coal in a smokeless manner, thus conforming to smoke ordinances which are bound to follow wholesale conversions from oil to coal. Colloidal fuel also does away with the objection to coal gases for those situated nearby. It eliminates the problem of locating the necessary labor for firing of the coal and it also eliminates the need for hauling of ashes.

Present Developments

Much money and time has been spent on the development of colloidal fuel during the period between World War I and World War II. In the United States the Bureau of Mines is experimenting with a pilot plant at the Atlantic Refining Co., Philadelphia, while the Ordnance Office of the War Department and the Petroleum Administration for War have made extensive investigations and optimistic reports on the possibilities with the use of such fuel. At the present time the Eastern Corporation of Bangor, Maine, is building a mixing plant which will reduce their oil consumption in their pulp and paper mills by 100,000 barrels per year. This will not, however, be a true colloidal plant because the fuel is to be fired almost immediately into the boilers directly from the mixing container. Provisions have been made for only 12 hours of storage. Bethlehem Steel Co. is experimenting with colloidal fuel at its Bethlehem plant; and Berwind White Coal Mining Co., in cooperation with the Pennsylvania Railroad, will soon start upon the installation of a plant. Other experiments with colloidal fuel are being made by the Gulf Oil Co., Hercules Powder Co. and several paper companies.

To the foregoing list must be added one who does not use fuel of any kind, but rather sells oil and will soon sell colloidal coal-oil—the Metropolitan Petroleum Corporation of New York City. With its present river, dock, oil storage and distribution plant facilities for the supply of oil to retail dealer trucks, this needs concern only (a) the addition of pulverizers to powder the slack bituminous coal; (b) adequate coal storage; (c) a motor driven propeller type agitator in a tank for premixing the coal and heated oil; and (d) colloidal mills to reduce the size of coal particles and produce a more intimate mixture of the coal and oil. After these steps the product goes to storage tanks and from then on is handled just like No. 6 oil. In this way the oil company keeps its customers through the use of a substitute fuel and helps maintain the small retail oil dealers in business. The capacity of its preparation plant is 600,000 barrels per year. The present plant, with a super-imposed sketch showing the added colloidal fuel equipment, is shown in Fig 1. Fig. 2 is a schematic drawing showing the process from the receipt of solid fuel at the silo to liquid fuel at underground tank storage. Deliveries up to 60 miles will be feasible.

Combustion Characteristics

Colloidal fuel has a lower ignition temperature and a higher Btu value than has straight fuel oil and in burning has a flame temperature 200F higher than that obtainable with fuel oil (due to the lower percentage of hydrogen), so that the production of existing high temperature metallurgical oil furnaces can be increased from 25 to 50% with a corresponding saving in fuel, time and oxidation of metal. Other savings are effected due to the lower vapor and carbon losses in the products of combustion. Thus, 4 to 5% more available heat units are obtainable from the total heat units fired per pound of coal. Practice has shown that the increased fineness of the burning particles not only reduces the carbon losses from stacks but also permits the burning of colloidal fuel at 16½% CO_2, again increasing the fuel economy due to the smaller quantity of excess air required. Because of the increase in practical burning temperature there is also a smaller capital outlay required for industrial furnace equipment. In boiler furnaces the minute ash and coal particles give off tremendous amounts of high temperature radiation during combustion, resulting in improved transfer while at the same time the stack temperatures are lower for a given steam output. For quick handling it is necessary to maintain the temperature of colloidal fuel in storage only slightly higher than is required with No. 6 fuel oil.

Physical and Chemical Properties

Colloidal chemistry, the comparatively new science to which colloidal fuel belongs, considers the coal particle as reduced to colloidal dimensions approaching those of the molecule. This reduction is accomplished by fine grinding in a colloidal or rubbing mill having less clearance between grinding surfaces than is found between moving surfaces in close-fitting bearings. Adjustable control of the space between a fixed and moving head establishes the fineness. Number 6 fuel oil is squeezed through the mill under pressure, the coal particles becoming coated and protected by the molecular oil penetrating membranes so that homogenization is completed and it is probable that these films of oil hold one particle to the other. The resulting colloid structure gives a strong cohesive surface tension and although the oil is an apparent liquid it will not pass through a filter.

Because its molecular tension is greater than that of water, colloidal fuel when made without a fixative is stable so that it can be stored for long periods under water without separation or emulsification and will not require any agitation at the point of consumption. Stability, while dependent mainly upon the size of coal particles, is also affected by viscosity of the oil, density of the coal and oil and the electrostatic charges on the coal particles from friction during grinding. The oil is a poor conductor so that the charges are slowly neutralized.

No noticeable deposits in pipe lines or in storage tanks sufficient to cause difficulties have been observed. This statement applies only to true colloidal fuel as prepared in a colloidal mill and not to a mere mechanical mixture of oil and powdered coal where stabilization is attempted by increasing the viscosity through the introduction of metal soaps, fatty acids or coal tar. A portion of the coal-oil mixture sinks and the balance floats, this being especially true when stability is broken by heating about 120F or by mechanical agitation. Former difficulties with storage, transport and burning were due to the use of so-called colloidal oil.

Colloidal fuel heated to 200F has the same viscosity as Bunker "C" oil. It can be more readily controlled and, being fine, is suitable for use in any ordinary fuel oil system now burning Bunker "C" oil without screening or any conversions or changes to the fuel oil system.

The ash particles from colloidal fuel being about 0.1 micron in size are not too abrasive nor injurious to health. Due to a high ratio of surface area to mass, the particles radiate energy rapidly and have only slight heat storage capacity, solidifying instantaneously in the suspended combustion gases without causing slag or coalescent troubles. The coal used should be bituminous with a low ash content and high fusion temperature. A fairly high volatile range is also desirable. Fine grind-

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WASHINGTON NEWS

Summarized by Loring F. Overman. Freon Allocations Are Reduced 80%; Use of Steel for Refrigeration Eased; Centralized Oil Control Is Planned.

A Freon shortage so acute that WPB issued an order prohibiting delivery of the refrigerant for use in comfort cooling systems, and a strike-inspired threat of a coal shortage that may find solid fuels rationed in a manner similar to that now applied to oil, were highlights of the month in Washington from the standpoint of the heating and ventilating industries.

The coal strike and the dramatic over-riding of the President's veto has made the headlines and editorial columns so consistently that it requires little comment in this publication. In Washington, however, there is still the realization that Presidential vetoes and Congressional revolts do not mine coal. Consequently, the effects of current work stoppages are being studied apprehensively, with possible effects on next winter's heating and power requirements in mind.

The probability that coal rationing will be necessary if work stoppages are not immediate and permanent have been mentioned publicly in Washington. Such a program is not contemplated if reports from the pits are favorable, but it can be assumed that the blueprints for a coal rationing program are being drafted, just in case.

Shipments Frozen

Typical of the actions planned and ready for instant imposition if necessary was an order issued June 21, freezing an estimated three million tons of railroad-borne bituminous coal in transit. The order restores to full effect and order issued April 30 by the War Production Board, prohibiting deliveries of certain railroad-borne coal to consumers who have more than 10 days supply. The order has been twice suspended since its issuance, the return of miners to work removing, in previous instances, the need for its continuance. A similar order applying to anthracite coal, was not reinstated June 21.

The June 21 order, as issued by Solid Fuels Administrator Ickes, further amends the original War Production Board Order by exempting from the freeze coal loaded on June 21 and thereafter from mines which have not suspended production or which resume production.

Freon Shortage

Most important Washington action of the month from the standpoint of the air-conditioning industry was the June 5 amendment of General Limitation Order M-28 (Chlorinated Hydrocarbon Refrigerants), barring the delivery after June 5 of Freon to any comfort cooling system.

The air-conditioning section of the War Production Board explains that through the month of May, supply made it possible to allot 100% of all requests received for allocations of Freon, but that for the month of June all allotments were reduced by 80%. This drastic shortage, permitting delivery of only 20% of requested allotments, is said to be due to the shortage of cylinders for transport of the gas, and to the completion of a large number of defense-connected installations requiring initial fillings.

Allotments for July will be "somewhat higher" than for June, but indications are that serious shortages will continue throughout the summer. In its latest release to owners of comfort cooling systems the WPB Air Conditioning section states that it is imperative for theaters, office buildings, hotels, restaurants and other services operating comfort cooling systems to take immediate steps to conserve their present supplies of the refrigerant.

This need not mean imminent shut-down of currently operating cooling systems, it was pointed out. With proper care and maintenance of existing equipment, the refrigerant can be used for several years without deterioration.

However, to assure continued operation of the equipment, a complete check and necessary repairs should be made without further delay as a precaution against leakage or loss of the refrigerant, officials emphasized. Once present charges of the refrigerant are lost, there will be no possibility of replacing them under present restrictions, it was pointed out. This, in effect, will force abandonment of the air-conditioning system until Freon is once more available.

Emergency Repairs

Where emergency repairs are necessary, repair and maintenance parts may be obtained through ratings assigned under Controlled Materials Regulation No. 5. Such ratings cannot be used, however, to obtain gas cylinders from manufacturers, according to Interpretation 1 of General Preference Rating Order M-233, issued June 25. This interpretation applies whether the user carries his cylinders as operating supplies or as capital equipment.

Many users of gas cylinders have erroneously attempted to apply an AA-1 preference rating under CMP 5 to obtain cylinders. Item 1 of List A of the regulation specifically excludes containers of all kinds.

The ban on refrigerants outlined in Amended Order M-28 does not affect deliveries of carbon dioxide or any type of refrigerant, other than Freon, used in comfort cooling systems.

New Oil Control Group?

Plans for a new intergovernmental group with broad supervisory powers over distribution of fuel oil and gasoline are being discussed. Petroleum Administrator Ickes' request that he be assigned fuel oil distribution has been rejected by Production Chief Donald Nelson, but indications are that a new group may include representatives of Mr. Ickes' office, OPA, and ODT.

There is a general recognition in Washington that authority in the field of fuel oil production and distribution is spread rather thinly over too many agencies. A noticeable result is frequent conflict in official statements relating to the oil situation.

For example, late in June Administrator Ickes told the Governors' Conference at Columbus that fuel restrictions in the East would continue for the duration, while Donald Nelson, in Washington, was telling a congressional committee that "relief" was in sight. It was later explained that Mr. Nelson did not mean that more fuel would be available, but that he was promising relief from confusion.

In another recent conflict of statements, Administrator Ickes argued

against extending the Eastern driving ban to the Middle West, explaining that there were not enough tank cars or rail facilities to bring enough oil East on from the Midwest to justify the action. Then ODT Director Eastman, before another congressional committee, reported railroads ready to handle an additional 9000 or 10,000 tank cars. He indicated steps will be taken soon to start these cars hauling petroleum from Texas and Oklahoma.

Combined Forecast

Despite certain conflicting statements, Washington spokesmen expect that by September, pipelines will be bringing into the East 514,000 barrels of petroleum daily; waterways 211,000; Gulf tankers 30,000 and tankers 835,000. That would represent receipts far in excess of peacetime, but officials warned that does not mean more gasoline and fuel oil for civilians. Military demands, it was explained, continue to increase more rapidly than transportation facilities can be added.

The consensus is that civilians in the shortage area should expect no immediate change in the gasoline and fuel oil situation. Barring unforeseen developments, home owners will get about the same amount of fuel oil next winter as they received last season. Owners of small houses and other hardship cases will receive additional supplies next winter, but no general increase is in prospect.

Steel for Refrigeration

By Amendment No. 1 to Schedule II of Limitation Order L-126, as amended March 27, WPB has eased restrictions on the use of steel in specifically named parts of certain sizes of refrigerating equipment. The most important provisions:

Permit manufacture of water cooled condensing units of two horsepower or less designed to operate at a refrigeration suction temperature below —40F;

Permit the manufacture of three horsepower air-cooled condensing units, three horsepower water-and-aircooled models and special models operating below 25F;

Permit the use of carbon steel for condensing unit bases to the extent of 30 lb per horsepower and an unlimited amount of cast iron; and

Remove restrictions on the use of steel in fan shrouds.

Fans and Blowers

Provision requiring all manufacturers of fans and blowers to file monthly detailed delivery schedules were deleted June 21 by the amendment of War Production Board Order M-280. Selected manufacturers now file delivery schedules on Form Pd-901 under the terms of General Scheduling Order M-293.

Other minor changes are made in the amended order to remove dates no longer applicable. Acceptance and delivery of purchase orders are now restricted to those with preference ratings of AA-5 or higher, without regard to dates.

Production Scheduling

Members of the heating and ventilating industry concerned with the design, manufacture and installation of equipment required by the war effort will watch with interest for first reports of progress of Component Scheduling Procedures, placed in effect by WPB on June 1. The procedure is designed to increase production of fighting equipment by getting the right component parts to the right manufacturer at the right time.

Earlier breakdowns in the war production program have been blamed on maldistribution of orders, inadequacies in the priorities system, unrealistic delivery schedules and to failure to place orders well in advance. Several members of the heating and ventilating industry have had opportunity to watch the new system at work, for products of these industries rate high in the list of critical components.

All of the wartime "claimant agencies" are involved, and the program includes ships of all sizes and types; tanks, combat vehicles; power generating plants; and plants designed for the production of rubber, high octane gasoline, aluminum, magnesium and steel.

Important to the program are "control components"—turbines and turbogenerators, motor-generator sets, internal combustion engines, boilers, compressors and dry vacuum pumps, turbo blowers and exhausters, steam condensers, heat exchangers, pressure vessels, fans and blowers, switch

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JUNE WASHINGTON NEWS HIGHLIGHTS

EDITOR'S NOTE:—As a feature of its monthly Washington News, HEATING AND VENTILATING publishes a digest of news releases, publications and other data of particular interest to the heating, ventilating and air conditioning industries. Complete copies of data listed can be secured by writing U. S. Information Service, 1400 Pennsylvania Avenue, Washington, D. C. In the following listing, the first figure is the date of issuance; the figure following each listing is the identification number:

June 24—EAST COAST PETROLEUM SUPPLY. Stocks of all petroleum products on the East Coast continued to inch upward from disastrous levels of a few weeks ago, Petroleum Administrator for War announced. OWI-2085.

23rd—UNUSED PRIORITIES CALLED BACK. Long pending and unused priorities for war housing projects will be recovered and reallocated to builders who are prepared to go ahead with construction, it was announced today by WPB and NHA. WPB-3905.

21st—FUEL PROSPECTS. Fuel prospects for the coming winter are outlined in a report by the Office of War Information. OWI-2050.

21st — ANTHRACITE DISTRIBUTION PLANNED. Temporary distribution measure to insure that every community will receive its fair share of anthracite prior to institution of permanent wartime hard coal program was announced by Solid Fuels Administrator Ickles. OWI-2069.

21st — FAN BLOWER RULE MODIFIED. General Limitation Order M-280, as amended today by WPB, effective June 21, deletes former provisions requiring all manufacturers of fans and blowers to file monthly detailed delivery schedules. TSC-69.

19th—REFRIGERATION MATERIALS EASED. Restrictions on use of steel in specifically named parts of certain sizes of refrigerating equipment were eased today by WPB with the issuance of Amendment I to Schedule II of Limitation Order L-126, as amended March 27, 1943. TSC-56.

18th—OIL OUTPUT RATE SET. Petroleum Administrator Ickes announced that production rate of 4,328,500 barrels daily of all petroleum liquids has been certified to various petroleum-producing states for July, an increase of 109,600 barrels daily over amounts certified for June.

15th—FORM PD-200 REPLACED. Form PD-200, used to make application for authority to begin construction and for priority assistance, has been replaced by new form known as WPB-617. WPB-3883.

13th — PROMPT FUEL ACTION URGED. Occupants of oilheated homes should act promptly in returning applications for next year's fuel oil rations to their war price and rationing boards in order to benefit fully from plans to assure them adequate supplies in their fuel tanks before winter sets in, OPA announced. OPA-2655.

9th — WPB FIELD POWERS ENLARGED. Types of construction for which applications are processed in Regional Offices were enlarged in amendment to field administrative order 708-20, WPB announced today. The order delegates authority to regional directors to permit construction under Order L-41 and to issue preference rating orders provided estimated cost is less than $10,000.

8th—CERTAIN REFRIGERANTS PROHIBITED. Sale or receipt of Freon for use in comfort cooling systems is prohibited by provisions of amended General Preference Order M-28, issued today. WPB-3801.

8th—CERTAIN STEEL VALVES FREED. The Office of Price Administration today exempted from price control steel valves, valve parts and sub-assemblies, as well as any operation performed in processing, machining, welding, treating or finishing of these products when sold or performed by new subcontractors to and for valve manufacturers under contract with Navy Department for these articles, under Amendment 12 to Rev. SR-1, effective June 7. OPA-T-999.

4th—WPB APPROVES PIPELINE. Construction of 383-mile, 16-inch pipeline from Sundown, Texas, to Drumright, Okla., having initial capacity of 54,000 barrels of crude oil daily, was approved today by WPB upon recommendation of Petroleum Administrator Ickes.

DEGREE-DAYS FOR MAY, 1943

HEATING AND VENTILATING'S 15th year of publication of monthly degree-day data

City	Monthly Degree-Days			Cumulative Degree-Days			Year[1]
	Degree-Days, May, 1943	Degree-Days, May, 1942	Degree-Days, May, Normal	Season, 9/1/42-5/31/43	Season, 9/1/41-5/31/42	Season, Normal 9/1-5/31	Normal, 9/1-8/30
Abilene, Texas	37	17	0	2338	2393	2061	2061
Albany, New York	234	162	183	7343	6374	6580	6580
Albuquerque, New Mexico	60	89	40	3657	4478	4298	4298
Alpena, Michigan	459	407	465	8242	7174	8127	8299*
Anaconda, Montana	629	637	517	8052	8398	8010	8357**
Asheville, North Carolina	64	90	71	4151	3983	4232	4232
Atlanta, Georgia	10	25	0	2875	2920	2890	2890
Atlantic City, New Jersey	185	114	220	4867	4437	5176	5176
Augusta, Georgia	1	0	0	2179	2201	2161	2161
Baker, Oregon	534	506	431	6841	7036	6950	7163
Baltimore, Maryland	63	21	22	4409	3802	4533	4533
Billings, Montana	436	419	316	7215	7048	7059	7119
Binghamton, New York	235	183	254	6834	5994	6808	6808
Birmingham, Alabama	1	19	0	2478	2591	2352	2352
Bismarck, North Dakota	406	449	338	9359	7962	9147	9192
Block Island, Rhode Island	354	279	378	5984	5408	5689	5788
Boise, Idaho	345	384	236	5657	6139	5552	5552
Boston, Massachusetts	243	164	245	6156	5388	6045	6045
Bozeman, Montana	575	567	471	8058	8706	8195	8521**
Buffalo, New York	411	283	335	7275	6286	6810	6822
Burlington, Vermont	339	199	273	8208	7274	7511	7514
Butte, Montana	641	643	502	8690	9179	7926	8272
Cairo, Illinois	21	60	0	3880	3733	3909	3909
Canton, New York	307	225	334	8408	7474	8020	8020
Charles City, Iowa	330	299	224	8146	6690	7588	7588
Charleston, South Carolina	2	0	0	1911	2092	1769	1769
Charlotte, North Carolina	23	13	0	3079	2879	3120	3120
Chattanooga, Tennessee	15	32	0	3266	3513	3118	3118
Cheyenne, Wyoming	557	504	446	7004	7438	7340	7466
Chicago, Illinois	301	233	242	6849	5547	5957	5957
Cincinnati, Ohio	102	118	0	5102	4555	4684	4684
Cleveland, Ohio	240	182	220	6089	5374	6155	6155
Columbia, Missouri	126	126	22	5057	4495	4922	4922
Columbia, South Carolina	4	1	0	2379	2302	2364	2364
Columbus, Ohio	126	138	87	5517	4912	5398	5398
Concord, New Hampshire	323	214	298	7797	6887	7299	7353
Concordia, Kansas	232	178	65	5545	5112	5315	5315
Dallas, Texas	7	12	0	2321	2395	2256	2256
Davenport, Iowa	233	182	118	6622	5526	6289	6289
Dayton, Ohio	161	135	81	5576	4928	5264	5264
Denver, Colorado	387	297	267	5282	5933	5874	5874
Des Moines, Iowa	249	203	118	6718	5737	6384	6384
Detroit, Michigan	275	226	226	6790	5809	6490	6490
Devils Lake, North Dakota	497	493	424	10282	8819	9874	9970
Dodge City, Kansas	228	168	47	4939	4828	5035	5035
Dubuque, Iowa	272	228	149	7233	5921	6790	6790
Duluth, Minnesota	464	542	521	9629	8229	9267	9443
Eastport, Maine	514	505	543	8060	7498	7941	8520**
Elkins, West Virginia	173	152	177	5627	5282	5697	5697
El Paso, Texas	5	1	0	2205	2390	2428	2428
Ely, Nevada	470	587	(a)	6565	7976	(a)	(a)
Erie, Pennsylvania	303	215	257	6442	5612	6273	6273
Escanaba, Michigan	468	468	490	8779	7548	8608	8771*
Evansville, Indiana	51	106	0	4777	4417	4244	4244
Fort Smith, Arkansas	15	38	0	3090	3131	3147	3147
Fort Wayne, Indiana	239	200	130	6722	5827	5925	5925
Fort Worth, Texas	11	11	0	2322	2386	2148	2148
Fresno, California	21	76	0	2419	2518	2334	2334
Galveston, Texas	0	0	0	1046	1321	1016	1016
Grand Junction, Colorado	170	187	118	4735	5624	5548	5548
Grand Rapids, Michigan	291	215	174	6873	5813	6535	6535
Green Bay, Wisconsin	322	334	322	8181	6822	7825	7825
Greensboro, North Carolina	50	36	0	3873	3683	3529	3529
Greenville, South Carolina	20	17	0	3125	2987	3380	3380
Harrisburg, Pennsylvania	115	64	90	5428	4836	5375	5357
Hartford, Connecticut	194	120	202	6434	5662	6036	6036
Hatteras, North Carolina	21	1	0	2539	2401	2571	2571
Havre, Montana	410	395	369	8398	7635	8556	8700
Helena, Montana	499	509	402	8452	8473	7663	7898
Houston, Texas	0	0	0	1212	1406	1157	1157
Huron, South Dakota	387	352	267	8410	6953	8004	8004
Indianapolis, Indiana	158	131	59	5776	4795	5298	5298
Ithaca, New York	268	217	242	6939	6150	6719	6719
Kansas City, Missouri	153	134	6	5064	4468	4956	4956
Kewanee, Illinois	279	103	126	7042	5047	5638	6139
Knoxville, Tennessee	33	47	0	3696	3536	3670	3670
La Crosse, Wisconsin	327	278	183	8113	6419	7322	7322
Lander, Wyoming	476	478	428	7500	8395	7812	7947

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with eight exceptions, based on local weather bureau reports. Exceptions are Utica, Lewiston, Kewanee, and Sioux City, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; Norman E. Ross, Bursar, Bates College, Lewiston, Me.; J. M. Hartman, Engineering Department, Kewanee Boiler Corp., Kewanee, Ill., and Alfred R. Wagstaff, Engineer, Sioux City Foundry and Boiler Co., Sioux City, Iowa, respectively; Anaconda, Bozeman, Butte and Livingston, Mont., through the courtesy of the Montana Power Company.

(a) Data not available.

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Degree-Days for May, 1943 (Concluded)

HEATING AND VENTILATING'S 15th year of publication of monthly degree-day data

City	Monthly Degree-Days			Cumulative Degree-Days			Year[1]
	Degree-Days, May, 1943	Degree-Days, May, 1942	Degree-Days, May, Normal	Season, 9/1/42-5/31/43	Season, 9/1/41-5/31/42	Season, Normal 9/1-5/31	Normal, 9/1-6/30
Lansing, Michigan	322	258	229	7369	6250	7048	7048
Lewiston, Maine	321	263	344	7881	7210	7662	7707
Lincoln, Nebraska	234	210	99	6108	5534	5999	5999
Little Rock, Arkansas	1	33	0	3045	3012	2811	2811
Livingston, Montana	530	541	405	7202	7556	7043	7205
Los Angeles, California	44	98	90	1125	1328	1504	1504
Louisville, Kentucky	47	103	0	4505	4094	4180	4180
Lynchburg, Virginia	57	18	0	3916	3547	3980	3980
Macon, Georgia	1	8	0	2244	2392	2201	2201
Madison, Wisconsin	330	283	236	7818	6484	7429	7429
Marquette, Michigan	468	486	496	8666	7418	8464	8693*
Memphis, Tennessee	3	33	0	3160	3260	2950	2950
Meridian, Mississippi	0	8	0	2179	2438	2160	2160
Milwaukee, Wisconsin	380	330	350	7649	6539	7206	7245
Minneapolis, Minnesota	321	290	236	8550	6847	7850	7850
Modena, Utah	310	427	350	5837	6924	6520	6562
Montgomery, Alabama	0	2	0	1922	2157	1884	1884
Nantucket, Massachusetts	355	275	384	5953	5424	5834	5957
Nashville, Tennessee	18	50	0	3640	3454	3507	3507
New Haven, Connecticut	193	139	223	5948	5230	5895	5895
New Orleans, Louisiana	0	1	0	1205	1350	1024	1024
New York, New York	162	82	155	5308	4703	5347	5347
‡Nome, Alaska	1317	1146	1443	12118	10247	12085	14580**
Norfolk, Virginia	32	5	0	3190	3010	3350	3350
Northfield, Vermont	392	262	391	8655	7708	8528	8719*
North Head, Washington	445	362	422	4556	4242	4693	5452**
North Platte, Nebraska	323	279	199	6096	6116	6366	6366
Oakland, California	194	262	205	2726	2772	2870	3143**
Oklahoma City, Oklahoma	105	67	0	3559	3402	3613	3613
Omaha, Nebraska	240	217	84	6364	5794	6131	6131
Oswego, New York	374	270	357	7274	6406	7025	7088
Parkersburg, West Virginia	98	125	53	4956	4573	4775	4775
Peoria, Illinois	228	174	121	6337	5340	6109	6109
Philadelphia, Pennsylvania	115	43	68	4914	4296	4855	4855
Phoenix, Arizona	0	2	0	1013	1404	1405	1405
Pittsburgh, Pennsylvania	130	110	78	5325	4778	5235	5235
Pocatello, Idaho	390	487	332	6371	7716	6595	6655
Portland, Maine	377	328	366	7786	7006	7137	7218
Portland, Oregon	266	249	245	4050	4075	4379	4469
Providence, Rhode Island	203	124	251	5958	5304	6015	6015
Pueblo, Colorado	287	193	186	5206	5788	5514	5514
Raleigh, North Carolina	29	11	0	3210	3024	3234	3234
Rapid City, South Dakota	421	450	344	7371	6676	7088	7118
Reading, Pennsylvania	121	70	96	5340	4720	5389	5389
Redding, California	50	174	0	2506	2764	2451	2451
Reno, Nevada	321	417	366	5186	5834	5802	5892
Richmond, Virginia	60	7	0	3807	3535	3695	3695
Rochester, New York	277	217	260	7130	6304	6732	6732
Roseburg, Oregon	266	276	267	3793	4023	4314	4428
Roswell, New Mexico	41	43	0	2937	3499	3484	3484
Sacramento, California	43	138	53	2476	2651	2653	2653
St. Joseph, Missouri	190	172	16	5516	4943	5161	5161
St. Louis, Missouri	93	91	0	4676	4168	4585	4585
Salt Lake City, Utah	304	378	236	5499	6334	5555	5555
San Antonio, Texas	0	2	0	1408	1509	1202	1202
San Diego, California	28	63	115	1111	1256	1639	1645
Sandusky, Ohio	220	176	183	6230	5388	6208	6208
San Francisco, California	224	267	264	2446	2403	2681	3264**
Sault Ste. Marie, Michigan	521	493	502	7940	8331	8950	9285**
Savannah, Georgia	0	0	0	1556	1546	1490	1490
Scranton, Pennsylvania	194	123	171	6394	5586	6129	6129
Seattle, Washington	322	262	316	4331	4103	4695	4934**
Sheridan, Wyoming	466	473	403	7310	7453	7888	8008
Shreveport, Louisiana	0	6	0	2106	2279	1938	1938
Sioux City, Iowa	285	273	164	7287	6432	6898	6898
Spokane, Washington	393	380	285	6448	6430	6274	6355
Springfield, Illinois	146	122	56	5522	4753	5373	5373
Springfield, Missouri	111	160	12	4680	4478	4428	4428
Syracuse, New York	261	219	267	7205	6279	6881	6893
Tacoma, Washington	353	291	332	4665	4470	4883	5181**
Terre Haute, Indiana	111	118	0	5282	4637	4872	4872
Toledo, Ohio	251	193	180	6619	5627	6077	6077
Topeka, Kansas	165	142	34	5081	4583	4969	4969
Trenton, New Jersey	136	61	81	5343	4709	4933	4933
Utica, New York	283	195	253	7471	6597	6796	6796
Valentine, Nebraska	381	394	273	7187	6775	7039	7039
Walla Walla, Washington	255	232	171	4935	4949	4808	4808
Washington, D. C.	73	23	25	4376	3900	4626	4626
Wichita, Kansas	186	149	0	4839	4483	4673	4673
Williston, North Dakota	439	441	362	9418	8078	9269	9323
Winnemucca, Nevada	322	440	324	5449	6400	6274	6427**
Yakima, Washington	268	221	186	5690	5372	5599	5599

‡Nome data are for April.

*Includes August **Includes July and August

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

TUBE-TURN WELDING FITTINGS—RANGE OF SIZES

Type of Fitting	Description	Standard Weight	Extra Strong	Schedule 160	Double Extra Strong	Light Gauge	
						Nominal Pipe Size	Iron Pipe Size
Elbows	90° Long Radius	½"-24"	¾"-24"	1"-14"	1"-8"	4"-24"	3"-12"
Elbows	90° Short Radius	1"-30"	1½"-30"				
Elbows	45° Long Radius	½"-30"*	¾"-30"*	1"-14"	3"-8"	4"-24"	3"-12"
Returns	180° Long Radius	½"-24"	1"-24"	1"-14"			
Returns	180° Short Radius	1"-30"	1½"-30"				
Returns	180° Extra Long Radius	1"-2½"	1"-2½"				
Tees	Straight	½"-24"	½"-24"	1"-12"	1"-8"		
Tees	Reducing Outlet	¾x¾x½-24x20	¾x¾x½-24x20	¾x¾x¾-12x10	1x¾-8x6		
Reducers	Concentric & Eccentric	1x¾-24x20	1x¾-24x20		1x¾-8x6		
Caps		¾"-24"	¾"-24"		1"-8"		
Stub Ends	Lap Joint	¾"-24"	¾"-24"				
Nipples	Shaped, 90° to Header	1¼"-12"	1¼"-12"				
Nipples	Shaped, 45° to Header	1¼"-12"	1¼"-12"				
Saddles		2"-24"					
Laterals	Straight	1¼"-24"	1¼"-24"				
Laterals	Reducing	1¼"-24"	1¼"-24"				
Crosses	Straight	¾"-24"	¾"-24"				
Rings	Welding	¾"-12"	¾"-12"				
Sleeves	Welding	2"-24"					

SUPER Tube-Turn 45° long radius elbows, 90° long radius elbows, and 180° long radius returns available in both Standard weight and Extra Strong in sizes from 3" to 12".

Tube-Turn welding fittings and flanges conform to applicable ASA and ASTM Standards. For further details please refer to Tube Turns catalog and data book No. 111.

*30" size short radius.

TUBE-TURN FORGED STEEL FLANGES—RANGE OF SIZES

	150 Lb.	300 Lb.	400 Lb.	600 Lb	900 Lb.	1500 Lb.	2500 Lb.
Welding Neck	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Slip-On	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Lap Joint	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Threaded	½"-24"	½"-24"	½"-24"†	½"-24"	½"-24"*	½"-24"	½"-24"
Blind	¼"-24"	¼"- 4"		¼"-3½"			
Socket Type	¾"-24"	¾"-24"	¾"-24"	¾"-24"	¾"-24"	¾"-12"	¾"-12"
Reducing-threaded or slip-on		1"-24"	4"-12"	4"-12"	3"-12"	1"-12"	
Orifice—threaded		1"-24"					
Orifice—slip-on		1"-24"	4"-12"	1"-12"	3"-12"	1"-12"	
Orifice—welding neck		1"-24"	1"-10"	1"-10"	1"-10"	1"-10"	
Long Welding Neck	1"-24"	1"-24"					

†Dimensions on sizes thru 3½" same as for 600 lb. flanges.
*Dimensions on sizes thru 2½" same as for 1500 lb. flanges.

TUBE-TURN

Welding Fittings and Flanges

★ The ★ FIRST WELDING FITTINGS 1ST AND STILL THE BEST

TUBE TURNS (INC.) LOUISVILLE, KY. *Branch offices:* New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Houston, Los Angeles. *Distributors in principal cities.*

NEWS OF THE MONTH

Industry-Wide Indoor Climate Institute Proposed

CHICAGO—Plans for the formation of an industry-wide cooperative educational program known as the "Indoor Climate Institute" which will acquaint the American public with the best equipment and methods for producing indoor comfort in the post war homes of tomorrow, were disclosed May 26 by Paul B. Zimmerman, vice-president, Airtemp Division, Chrysler Corp., speaking before the National Warm Air Heating and Air Conditioning Association. The Indoor Climate Institute program has been under consideration by a steering committee representing all divisions of the heating industry for several months.

Details of the program have been worked out by a steering committee made up of P. B. Zimmerman, Chairman; C. E. Lewis, Delco Appliance Corp.; C. T. Burg, Iron Fireman Mfg. Co.; L. N. Hunter, National Radiator Co.; J. M. McClintock, Illinois Iron and Bolt Co.; C. D. Lyford, Minneapolis-Honeywell Regulator Co.; J. R. Scott, Mueller Furnace Co.; J. W. Grover, Surface Combustion Corp.; A. T. Atwell, Quaker Mfg. Co. and W. H. Knowlton, Airtemp Div., Chrysler Corp., Secretary.

When the final organization of the Institute is developed as a non-profit corporation it is to be governed by a group made up of individuals representing trade associations in the fields of boilers, controls, warm air heating, oil burning units, gas equipment, stokers, steel boilers and auxiliary equipment. Additional representatives at large will serve on the board. The Institute will be supported by subscriptions from manufacturers of heating units and auxiliary equipment in the heating and air conditioning industry.

Promotional and educational plans formulated in the headquarters' office will be carried to local organizations in the key cities of the country. It is expected that the local groups will be supported by fuel interests, utilities, dealers, contractors, jobbers, manufacturers' agents, and others interested in the welfare of the heating industry.

In answering the question, "Why a national cooperative program?"—Mr. Zimmerman stated that the public is somewhat confused by the many general claims made for all types of heating and air conditioning equipment, and it has not yet been sold on good heating and air conditioning as a sound value.

By combining its educational and promotional efforts, the industry as a unit can give the public one single strong story without the usual conflict of individual advertising. This story will be of news interest and will be well supported by the press, because it will permit the publishers to promote this great new development without being partial to any one interest.

The ICI contemplates the issuance of identification seals. The national organization will furnish them to manufacturers of automatic heating and air conditioning equipment meeting ICI standards; the local organizations will furnish them to installing dealers and contractors handling work in accordance with the best established local practice.

Plans provide for local bureaus established under the national Institute program to furnish a consulting service for home owners, dealers, contractors, architects, engineers, and builders. The local bureau will check plans to see that the heating system is to be installed according to the best known practice, and advise people interested as to necessary changes.

It is suggested that meetings will be held in all principal cities to acquaint the local trade and building interests with the program.

The national office will issue publicity that can be used in national magazines, newspapers, and by the business press. Local organizations will also serve as centers for issuing publicity that will be of interest to the local press. All campaigns will be carefully prepared to give the people complete information about improvements that have been made in indoor comfort.

C. T. Burg (seated, left), Iron Fireman Mfg. Co., discusses the Indoor Climate Institute program to (seated, left to right) R. E. Moore, Bell and Gossett Co.; J. M. McClintock, Illinois Iron and Bolt Co.; J. R. Scott, Mueller Furnace Corp.; (standing, left to right) Everett N. McDonnell, McDonnell and Miller; P. B. Zimmerman, Airtemp Division, Chrysler Corp.; C. D. Lyford, Minneapolis-Honeywell.

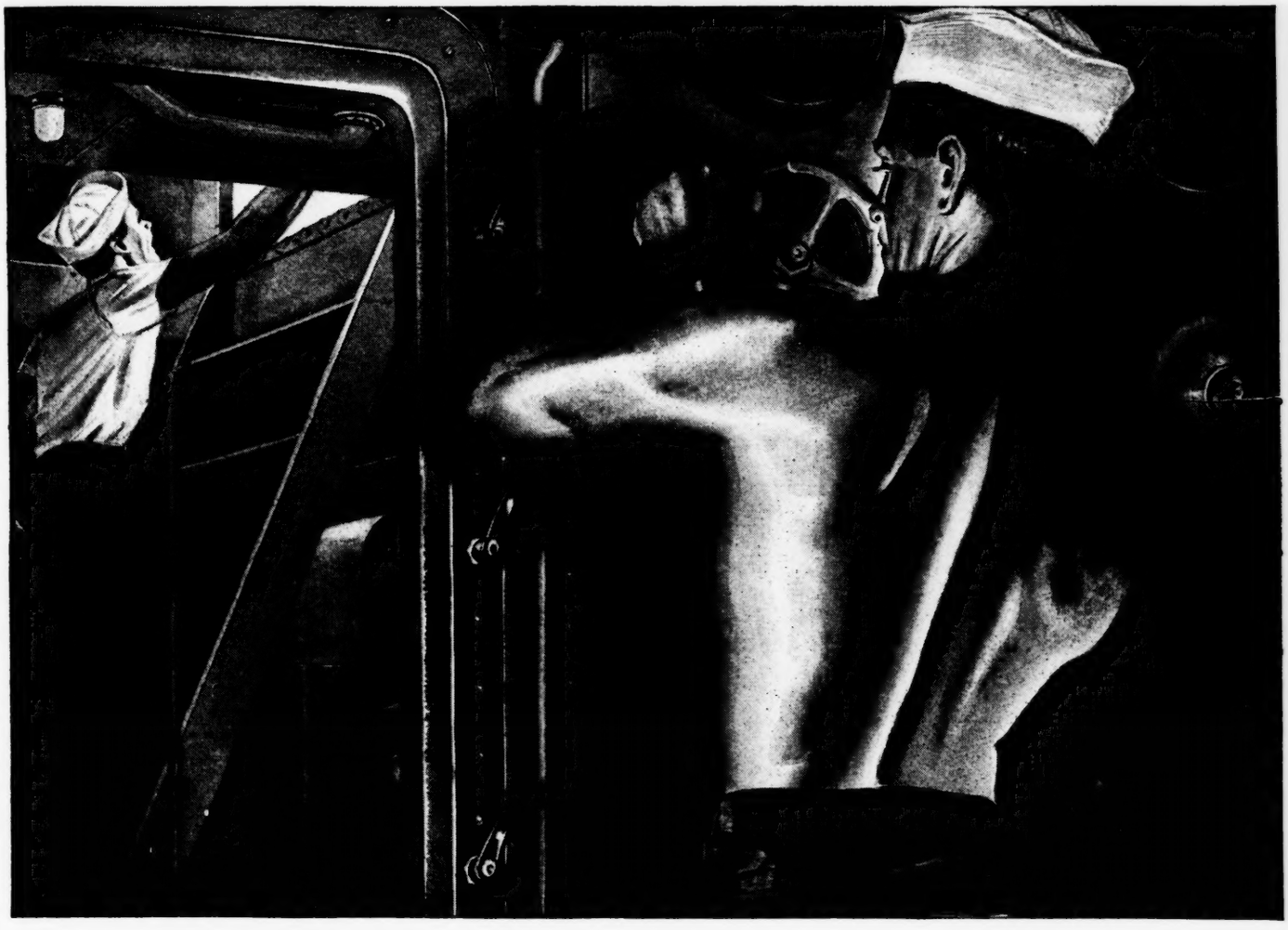
Stoker Group to Set Minimum Firebox Dimensions

CHICAGO—Over a hundred stoker executives and suppliers met in the two day 24th annual meeting of the Stoker Manufacturers' Association held at Lake Wawasee, Ind., June 13-14.

Prominent among the subjects given consideration was the proposed organization of the "Indoor Climate Institute." Following a presentation of this Institute's aims and purposes by J. M. McClintock, president of the Stoker Manufacturers' Association, the Association's membership unanimously endorsed the project.

The Association discussed the matter of dustproofing stoker coals and summarized its experience by stating that coals treated with hygroscopic salts ac-

(Continued on page 80)



Cool, clean air for sea fighters

A modern battleship is a giant steel honeycomb, crammed with complicated piping, myriads of electrical cables, huge boilers, turbines, equipment of every sort.

Men move in this labyrinth through shoulder-wide access hatches, along corridors so cramped that two men can scarcely pass. Many stations are buried deep in the center of the mammoth armor-plated hull. Cool, fresh, clean air must be continuously fed to every man on a battlewagon if he is to do his job efficiently.

Here's where Bethlehem Galvanized Steel Sheets are now at work—thousands of tons of them—in battleships, carriers, cruisers and destroyers. Sheet steel goes into air ducts by the mile—as well as into bulkheads, safety doors, galley equipment; it handles dozens of jobs which are vital to the efficient functioning of vessel and crew. Sheet steel is definitely a key material in our rapidly expanding Navy, and in the swiftly growing fleet of cargo vessels which supports fighting Americans on distant battlefronts.

BETHLEHEM STEEL

BETHLEHEM STEEL SHEETS

Stoker Meeting

(Continued from page 78)

celerate corrosion and increase maintenance costs.

Endorsement of the Association was also given to Better Home Heating, Inc., the organization in Minneapolis and St. Paul which is devoting its efforts to better heating with solid fuels. Stoker manufacturers were urged by the Association's Advertising and Executive Committees to support this program and the Association also voted a financial contribution as evidence of the stoker industry's faith in the purposes and objectives of Better Home Heating, Inc.

The Association also approved recommendations of the Engineering and Research Committee to (1) establish minimum firebox dimensions for stoker-fired boilers and furnaces from the small domestic sizes to commercial and industrial boilers having a capacity of 1,200 lbs. of coal per hr. stoker-fired; (2) establish a uniform method of rating and testing stokers; (3) affix S.M.A. plates to all stokers of member companies meeting test requirements certifying the feeding rate of various size stokers.

The Engineering and Research Committee was authorized to hold conferences with representatives of the cast iron boiler industry, the steel heating boiler industry, and the warm air furnace industry, to discuss designs of boilers and furnaces for stoker firing with particular emphasis on firebox dimensions, base heights and combustion space.

Printed leaflets expressing the stoker industry's position on the dustless treatment of stoker coals with hygroscopic salt base solutions will shortly be available to the trade from the office of the Association in Chicago.

Featured on the annual meeting program were addresses by Henry S. Norris, chief, Fuel Burning Equipment Unit, Plumbing and Heating Division, War Production Board, Washington, D. C., and his assistant, A. L. Smith. Mr. Norris and Mr. Smith discussed the fuel oil conversion-to-coal situation as it exists at present and the possibilities for next fall and winter. Many problems involving production, materials for manufacturing, fuels and the stoker industry's place in the war effort were discussed at lengthy and pertinent open forum sessions.

The Government representatives urged and cautioned stoker manufacturers to work closely with their sales and installation outlets to assure proper and satisfactory installations of stokers when replacing oil, particularly the new distributors and dealers located in the oil-famine eastern states. Current rules and regulations governing stoker sales and manufacturing were carefully reviewed. It is doubtful, from all indications, that the stoker industry will be permitted to manufacture Class "B" stokers (60 lb. of coal per hour and less) at least for the balance of 1943.

John M. McClintock, manager, Stoker Division, Illinois Iron & Bolt Company, Chicago, was re-elected president of the Association for another year. The following other officers were elected: Walter Sormane, sales manager, Schwitzer-Cummins Company, Indianapolis, vice president; and George W. Graham, president, Eddy Stoker Corporation, Chicago, treasurer. Marc G. Bluth was appointed executive secretary, the title being changed from secretary to executive secretary.

The following were elected as members of the Executive Committee: Messrs. McClintock, Sormane and Graham; Milton A. Young, manager, stoker division, Catskill Metal Works, Inc., Catskill N. Y.; Herman E. Winkler, executive vice president, U. S. Machine Corporation, Lebanon, Ind.; H. L. Bilsborough, manager, stoker division, Fairbanks, Morse & Co., Chicago; and E. C. Sammons, vice president, Iron Fireman Mfg. Co., Portland, Ore.

ASHVE Discusses Rationing, Radiant Heating, Ventilating, at Semi-Annual Meeting

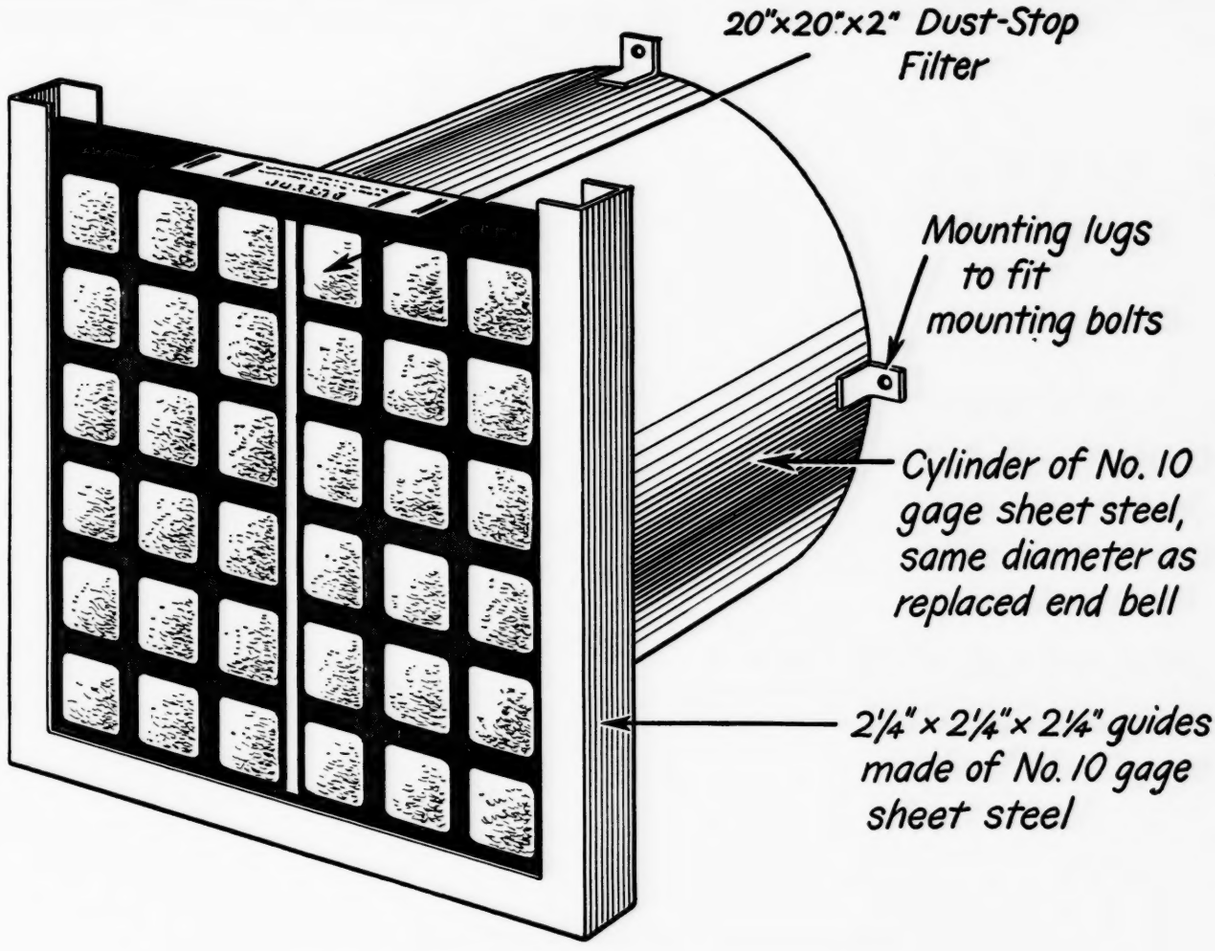
PITTSBURGH—Although the semi-annual meeting of the American Society of Heating and Ventilating Engineers, held at the William Penn Hotel here June 7-8, was cut to two days, with golf and other pleasure events eliminated, approximately 300 members and guests were present. All four technical sessions were well attended and the number of technical committee meetings was an indication of the importance of the war-time semi-annual conferences. The Council held two meetings and regular meetings were also held by the committee on research, war service committee, *Guide* publication committee and the nominating committee.

The first technical paper on the program was Performance of a Residential Panel Heating System, by H. F. Randolph, and J. B. Wallace, both of International Heater Company, Utica, N. Y. The paper described the results of tests on a house built by that company in Utica, with warm air ducts in ceilings, but with no outlets, and so designed that the house could be heated by radiant heating from the ceiling. The authors compared two methods of calculating the amount of heat input necessary with a radiant heating system, one using the *Guide* method, the other using the standard heat loss method, and showed that there was considerable discrepancy between the method outlined in the *Guide* and that obtained in actual practice in the test house.

The authors noted a low floor to ceiling temperature gradiant and an absence of drafts in the test house. In presenting the paper, Mr. Randolph said, however, that there was no fuel saving over conventional methods and indicated that in his opinion, it was not possible to carry lower room temperatures with radiant heating than with convection heating.

This paper was one of the most discussed of any recent meetings. Dr. F. E. Giesecke suggested introducing warm air into the room in slots near the ceiling as an advantageous method. In reply to a question from the floor, Mr. Randolph said that in his opinion the principal advantage of radiant heating was in eliminating visible heating equipment

(Continued on page 82)


20"x20"x2" Dust-Stop Filter
Mounting lugs to fit mounting bolts
Cylinder of No. 10 gage sheet steel, same diameter as replaced end bell
2¼" x 2¼" x 2¼" guides made of No. 10 gage sheet steel

DUST-STOP AIR FILTER inserted in a special end bell, prevents industrial grit and grime from circulating through the welder unit and injuring the mechanism.

What keeps welder units on the job

16 times longer?

EVERY WEEK, a certain Midwestern war plant found it necessary to take down some of its welding units and blow out harmful grit and dust. The job required the services of 6 men working full time.

But, that was before they installed Dust-Stop Air Filters.*

Today, these filters (see diagram above) are straining out virtually all industrial dust and dirt. In addition, the filters are quickly and easily replaced without shutdowns.

As a result, the welding machines of this company now *keep constantly on the job for as long as 16 weeks.* Moreover, only one man is required to handle the entire maintenance.

In scores of other important industries, Dust-Stops are helping to win the war against manufactured dust. Dust-Stop filtered air is helping to protect delicate precision parts used in making bomb sights, high-speed motors, tanks, airplanes, and other war equipment.

And speaking of economy—as original equipment for air-conditioning systems—they cost only about 1¢ per CFM to install. To replace, their cost is less than 1/10th of 1¢ per CFM.

Added economy may be gained by rapping out surface dirt or vacuum cleaning the filter face.

Dust-Stops are made from all-American materials which are not now listed as critical. If your regular supplier cannot give you full technical data about Dust-Stop Air Filters, write to *Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada, Ltd., Oshawa, Ontario.*

FIBERGLAS*

DUSTOP

*T. M. Reg. U. S. Pat. Off.

AIR FILTERS

ASHVE Meeting

(Continued from page 80)

from the room, and said that this was particularly desirable from the standpoint of the home owner, architect, and decorator.

At the second session Dean J. A. Goff, University of Pennsylvania, presented his paper Final Values of the Interaction Constant for Moist Air, by John A. Goff, J. R. Andersen, and S. Gratch. The paper reported final values of early action constant for moist air for the range from 5 to 25C as determined in a cooperative investigation by the Towne Scientific School of the University of Pennsylvania and the ASHVE. In the discussion John James, Iron Fireman Mfg. Co., Cleveland, asked Dean Goff to explain how the interaction constants obtained in the study would change on the psychrometric chart.

Dean Goff replied that in all applications of thermodynamics or engineering there are two fundamental propositions: the law of conservation of energy and the law of conservation of mass.

In air conditioning it is usual to analyze the case of steady flow in which the fluid moves through a duct. The air stream moves across a fixed section of a duct and the energy it carries with it is called enthalpy.

Because of the law of conservation of mass it is necessary to account for the total weight of water and total weight of dry air crossing any section. The pounds of water per pound of dry air is a ratio in use for years. This ratio is called the humidity ratio.

Enthalpy and the humidity ratio are fundamental coordinates for the psychrometric chart. In order to reduce the length of the chart it is useful to subtract out a thousand times the ordinate in plotting the values. Dean Goff then illustrated the construction of the psychrometric chart as a Molliere chart and pointed out its advantages in solving problems.

J. N. Livermore presented a paper, Study of Actual vs. Predicted Cooling Load on an Air Conditioning System, devoted to a study of the various components of the air conditioning load in the windowless Detroit-Edison building as compared with the computed load. There was considerable discrepancy. The discussion indicated that the paper had aroused great interest.

As pointed out in a discussion by J. H. Walker, of Detroit: "It is not often that the designer of an engineering project displays his calculations alongside of performance figures; nor in fact is it often in heating and air-conditioning that any detailed performance tests are made. On both of these points the author deserves commendation.

"The paper brings out at least two points which are impressive. The first one is that there may be an important time lag in the internal cooling load.

"Secondly, the paper shows how important are the design assumptions which must be made regarding such matters as the number of occupants, number of lights in use at the time of the peak cooling load, etc. Reasonable accuracy in those respects may be far more important than refinement in thermal calculations.

"More studies of this sort are highly desirable in order that design methods may be improved."

Spray Nozzle Performance in a Cooling Tower, by L. M. K. Boelter and S. Hori of the University of California, was presented by Dr. B. M. Woods of that University. This paper indicated that greater efficiency can be obtained from water spray cooling towers by the insertion of screen packings in the spray chamber, and that the greater portion of the cooling takes place near the nozzle, so that beyond a certain length of a spray cooled tower very little increase in conductance is obtained by lengthening the tower.

At the third session Professor J. R. Fellows, University of Illinois, presented a paper, Use of the Down-Draft Coking Method for Smokeless Combustion by J. R. Fellows and J. C. Miles. This was followed by a paper entitled, Field Study of Comfort Reactions of Apartment Dwellers Under Fuel Oil Rationing, by Sallye Hamilton. The study was made in Hillside Homes in New York City from November 16, 1942 to December 13, 1942. The data showed that with two-thirds fuel oil rationing it is not possible to maintain a room temperature of 65F in the apartments under study, excepting in those situated near the boiler, which have a minimum wall exposure, or receive maximum sunshine.

Professor F. B. Rowley presented his report on Heat Transmission through Insulation as Affected by Orientation of Wall, by F. B. Rowley and C. E. Lund. Following this P. D. Close, secretary, Insulation Board Institute, presented a Graphic Method of Calculating Heat Losses.

At the final technical session, H. E. Ziel, Office of Albert Kahn, and Henry Sleik, W. B. Connor Engineering Corporation, presented a paper entitled, The Economic Factors in Converting Recirculated Air for Ventilation. Mr. Sleik gave a discussion of general ventilation requirements and air treatment for air recirculation and Mr. Ziel gave the design problem involved in the practical application in a typical war plant. Presentation of this paper was followed by a Panel Discussion on Will Current Ventilating System Operation Undermine Public Health and Efficiency? The panel consisted of John Paul Jones, Cleveland, consulting engineer, L. L. Lewis, Syracuse, Chief Engineer Carrier Corporation, and Dr. C.-E. A. Winslow, second vice-president of the Society, and with John Howatt, chief engineer of the Chicago Board of Education, acting as chairman.

The ASHVE has concluded that a qualified director of research who could combine the duties of administrator of the Research Laboratory, liaison officer between the cooperative research organizations of the Society and in direct charge of the Research Program was needed, so that a new position, that of Director of Research, has been created by the Council. The chairman of the committee on research and the research executive committee have chosen for this position Cyril Tasker, senior research fellow of the Ontario Research Foundation.

A get-together luncheon was held on the first day, at which Howard Coonley, director, Conservation Div., WPB, spoke on Fuel Conservation.

Putting the "HELL" in a Shell

Between the time the gun is fired and the time the shell bursts a predetermined interval elapses, but the burst on the target must be timed to a split-second. That split-second-timing determines whether the "hell" in the shell is turned loose with much or little effectiveness. The split-second-timing depends upon the train of events, each of which must be precise—made more certain and more precise by Carrier air conditioning and refrigeration.

TIME FUSE

The time fuse is loaded and assembled in Carrier conditioned air to make sure the moisture in the powder will be held at precisely the right point.

SHELL

More and better quality steel is available for shells today thanks to Carrier air-conditioned blast furnaces.

ROTATING BAND

Only copper can be used for this part and more copper is available because men can work longer and more efficiently in mines cooled by Carrier equipment.

SMOKELESS POWDER

Carrier equipment and Carrier made materials are used for solvent recovery and ventilation in the manufacture of smokeless powder.

ARTILLERY PRIMER

The primer tubes disperse flame through the propellant charge of smokeless powder and do this more reliably because they are loaded in Carrier air conditioned rooms with black powder dried in Carrier dryers.

CARTRIDGE CASE

The cartridge case is brass—an alloy of copper and zinc, both of which are made available in greater quantities because many mines are Carrier air conditioned.

PRIMER

The train of events which leads to the "hell" is started by the impact of the firing pin upon the primer, which is made more precise by Carrier drying equipment and Carrier air conditioning.

These are just a few of the ways in which Carrier's experience in World War I is being used to advantage by America's munitions industry in World War II in the production of large and small calibre ammunition. Carrier engineers will be glad to apply their knowledge and experience to any problems you may have that may be solved by air conditioning and refrigeration. Discussions on post-war planning are also invited.

CARRIER CORPORATION • *Syracuse, N. Y.*

Carrier

ARMY E NAVY

AIR CONDITIONING • REFRIGERATION

INDUSTRIAL HEATING

FORTY-ONE YEARS EXPERIENCE IN INDUSTRIAL INSTALLATIONS

(Concluded from page 82)

Plaque presented to J. H. Walker by NDHA

Walker Honored by NDHA

PITTSBURGH — At the annual dinner in connection with the meeting of the National District Heating Association, held here June 9-10, J. H. Walker, The Detroit Edison Company, was presented with an honorary membership in the National District Heating Association and a plaque commemorating the event.

Mr. Walker, a graduate of the University of Michigan, entered the services of The Detroit Edison Company in 1912, and was appointed superintendent of central heating in 1918 and engineer assistant to the general manager in 1930. He was second vice-president of the ASHVE in 1941, is a member of the Council of that organization, and was president of the NDHA in 1921-22; he is a contributor to the Encyclopedia Britannica, chairman of many active committees of the ASHVE, ASME and NDHA, co-author of Heating and Air Conditioning by Allen and Walker, and co-author of the Piping Handbook, by Walker and Crocker.

ASHVE to Meet in New York

NEW YORK—The selection of this city for the 50th anniversary meeting of the American Society of Heating and Ventilating Engineers is announced. The dates chosen by the Council at its June meeting are January 31—February 2, 1944.

Low Temperature Expansion Valves Explained

LOS ANGELES—Recent developments in low temperature refrigeration were discussed in a talk presented before a general meeting of Southern California air conditioning, heating and refrigeration men at the Royal Palms Hotel, here June 9 by Franklyn Carter, Research engineer from the laboratories of the Detroit Lubricator Co., Detroit.

Mr. Carter discussed the application of thermostatic expansion valves and other late mechanical developments and their application to refrigeration systems operated at temperatures under —100F which are used for cooling rivets in plane plants, alto-chambers, test rooms for precision instruments and airplane parts, and cooling rooms for storing plasm in blood banks.

Stoker Forms

In the Oil to Coal Conversion Reference Section, published in the May issue of HEATING AND VENTILATING, a statement on page 45, third column, line 12, which read that "when the cost of the job runs in excess of $5,000, form PD-681 is used."

This was in error. In such cases the applicant should file form PD-200.

Form PD-681 is to be used for coal conveying equipment where the cost of that equipment exceeds $5,000. Before filing PD-681, however, it is necessary that the applicant have a priority rating.

Earle D. Parker

ROCKFORD, ILL.—Earle D. Parker, 63, vice-president and general works manager of Barber-Colman Company, died June 12, following a heart attack.

Earle D. Parker

For 40 years Mr. Parker was in the engineering and management divisions of the Barber-Colman Company, and for the past 20 years has served as general works manager. He became vice-president of the firm following Mr. Colman's death last fall.

Mr. Parker is survived by a widow, daughter, and two sons.

Harry B. Meller

PITTSBURGH—Dr. Harry B. Meller, 65, research engineer who pioneered in the field of smoke control, died here June 27 after having been in ill health for several years.

Dr. Meller resigned last September because of poor health as director of the Industrial Hygiene Foundation of America, a position he had held since its founding in 1935.

Frederick Hodges

DETROIT—Frederick Hodges, pioneer Detroit industrialist, died at his home in Grosse Pointe, of a heart attack. He was 78 years old.

Born in Detroit, he left the University of Michigan in 1885 to join his father in the operation of the Detroit Steam Radiator Company, which later became the American Radiator Company. In 1898 he set up factories for the company in France and Germany.

Four years later he became secretary of the Detroit Lubrication Company. He was president of the company when he retired in 1941.

Tear only follows Neglected Wear

Neglect of normal wear spells rapid, wasteful disintegration. In today's fuel emergency, neglect of heating equipment is sabotage.

The normal wear that has occurred in your heating system takes on a double significance today. Be sure that neglect doesn't allow this normal wear to develop into mechanical deterioration with resultant heavier demands on critical materials and manpower.

Fuel is a critical material. In your own interests and in the National Interest, *check your heating system with extra care this summer.* At every point, from boiler through mains, traps, valves, pumps, radiation and returns, see that minor replacements or corrections are made *now* to keep wear at normalcy and keep use of fuel to a minimum.

Dunham Differential Heating stretches the heat values of steam and advances fuel economies far beyond ordinary concepts. We will gladly send details. Just write to our Chicago office.

DUNHAM DIFFERENTIAL HEATING MAKES FUELS GO FURTHER

C. A. DUNHAM COMPANY
450 E. OHIO ST. • CHICAGO
TORONTO, CAN. **LONDON, ENG.**

REVIEWS of TECHNICAL publications

MICROMERITICS

"Micromeritics," by J. M. Dalla Valle. 6¼ x 9¼ in., 428 pages, cloth-bound. Published by Pitman Publishing Corp., New York. $8.50.

Reviewed by Lt. Col. Theodore F. Hatch

The physical and chemical properties of finely divided materials are of importance in many scientific and engineering fields. As a result of a great amount of research and study, much is known about the behavior of such materials and this knowledge is being applied routinely in the solution of everyday problems. Research in micromeritics, to use the author's new term, is characterized by the fact that it has been carried on in many wholly unrelated fields and reported in widely scattered journals. It is not surprising, therefore, to find duplication of work in many instances and lack of acquaintance in one field with the researches in another. In view of this situation, the author has performed a valuable service in bringing together within one volume the basic material from these many fields. Out of an extensive literature he has selected for discussion those aspects of the problem which appear to have the widest interest.

The author anticipates criticism because of the limited consideration given to the separate phases of the subject. Such criticism may be justified from the point of view of the specialist who is already familiar with the literature. To the engineer, however, who must use the laws of behavior of finely divided materials as tools in his work, the volume should be most welcome.

Throughout the book one will find the treatment, especially the mathematical considerations, clear and concise. Basic relationships are presented in the form of equations for immediate use. In a number of instances researches in unrelated fields have led to the development of different forms of equations to express the same fundamental laws. These differences have been reconciled or discrepancies pointed out.

The ventilating engineer will find much of interest in the book. Indeed, with the possible exception of the chapter on Muds and Slurries, every chapter contains material which is of concern in ventilation, especially in industry. The dynamics of small particles, the flow of air and other fluids through granular beds, the absorption of gases by fine material, the transport of particles in pipes, the phenomenon of heat transfer through particulate media and the collection and separation of particulate matter from air are some of the subjects discussed.

The chapter on the dynamics of small particles is comprehensive and includes not only a discussion of the three basic laws of Stokes, Newton and Allen, but also considers the relationship between those laws in terms of the dimensionless Reynold's Number. The recent mathematical treatment of the subject by Lapple and Shepherd is discussed at length. The material in this chapter is invaluable in the consideration of design of dust collecting and air cleaning devices.

No where in the field of study of fine particles has there been more confusion than in the determination and description of particle size. The many different definitions of "average" and "effective" diameters are considered and their significance in relation to basic definitions discussed. This chapter is followed by a full discussion of the technics and limitations of the various methods of determining particle size. Another chapter of particular interest in ventilation is on the thermodynamics of fine particles and includes discussion of heat conduction through packings, gas absorption by particulate matter and the processes of condensation and evaporation.

Since the 18 chapters cover different subjects it is not possible to consider them separately in a limited review. All are equally important and interesting. Throughout the book one finds an attempt to relate the behavior characteristics to the one common factor of particle size.

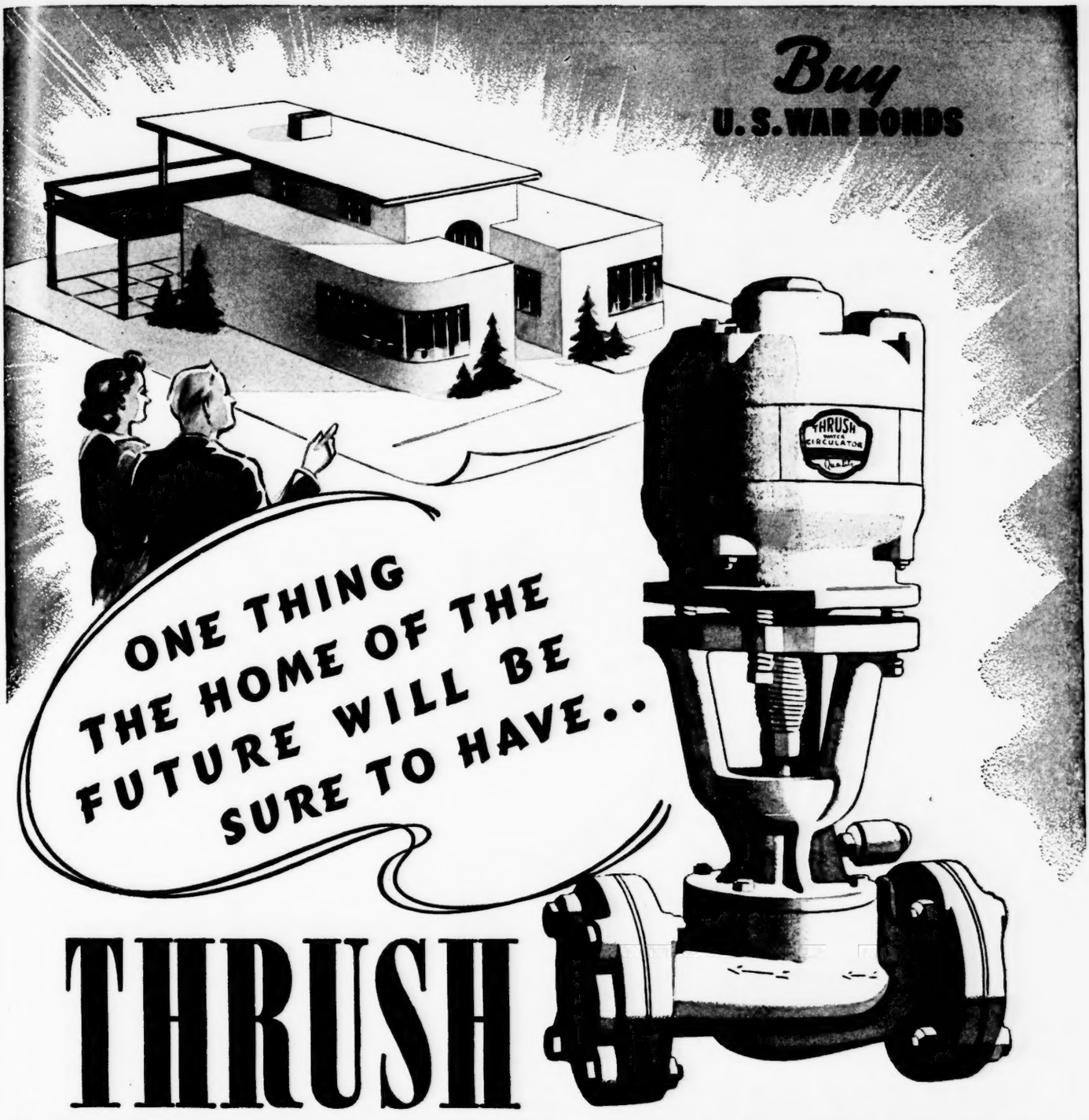
COAL

"The Dustless Treatment of Coals with Calcium Chloride and other Materials," by R. A. Sherman and G. W. Land. Published by Research Laboratories, Battelle Memorial Institute, Columbus, Ohio.

Information Bulletin No. 5 is a progress report on the extensive research work going on under the sponsorship of Bituminous Coal Research, Inc., in cooperation with the Calcium Chloride Association.

The report is principally concerned with the application of calcium chloride to four types of coal for the purpose of reducing dust in handling; but data on mixtures of calcium chloride with a papermill extract also are given. Preliminary data on corrosion and freeze-proofing of coal are included.

Booklet consists of 28 mimeographed pages, size 8½ x 11 in., paper cover.



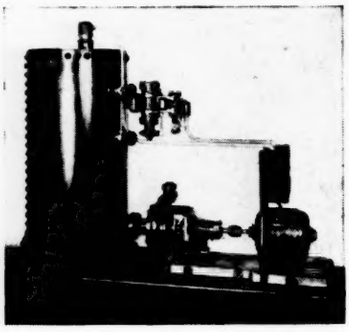
FORCED CIRCULATING "SUMMER-WINTER"

System of Hot Water Heat!

IDEAS are on the march! Improvements in products due to the War's demands will mean much to the home of tomorrow. In heating, Hot Water is coming into its own! Already we can predict... most of the better homes of the future will be almost magically heated automatically with Forced Circulating Summer-Winter Hot Water Heat at amazingly low cost. While our facilities today must all be devoted to working for Victory, Thrush Circulators, Valves and Controls are still available under Government priorities. Write Department D-7 for more information now.

H. A. THRUSH & COMPANY · PERU, IND.

NEW EQUIPMENT

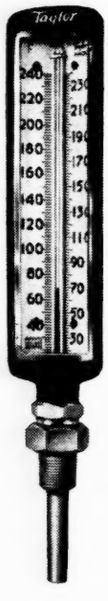


Feed Water System

NAME—Johnson high temperature boiler feed system.
PURPOSE—For feeding water into high pressure boilers.
FEATURES—An extension of the company's standard line of pumping units to make available both the standard coupled type of pump and the original close-coupled type in all sizes, is announced. The new units employ the company's standard pressure equalizing principle of operation whereby boiler pressure is introduced behind the pump during operating cycles, thus saving power and improving pump performance.
SIZES—For boilers from 30 to 500 hp and pressures up to 150 lb per sq in.
MADE BY—*Johnson Corporation, Three Rivers, Mich.*

Industrial Thermometer

NAME—Taylor one piece industrial thermometer.
PURPOSE—For measuring temperature.



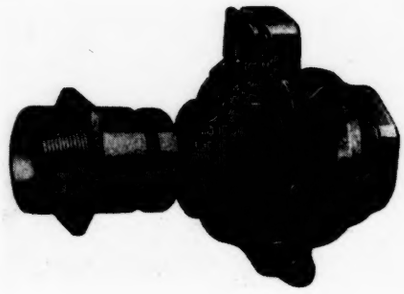
FEATURES—Made of non-critical materials of one-piece construction, this industrial thermometer with new type of case is said to be easier reading and sturdier, and to be greatly improved over previous types. Construction is such that instrument is said to be dustproof, rattleproof, and practically fumeproof. Many combinations of straight and angle stems with threaded or union connections available.
SIZE AND CAPACITY—Range limits —40F to 750F; standard scale lengths 7 and 9 in.
MADE BY—*Taylor Instrument Companies, Rochester, New York.*

Aluminum Coated Steel

NAME—Armco Aluminized Steel.
PURPOSE—For corrosion resistance.
FEATURES — Consists of a base metal of low carbon steel or copper steel, coated with essentially pure aluminum, thickness of coating ranging from .0012 to .0018 in. Corrosion resistance is due to the formation of a tight oxide film which is self-healing and very inert, being passive in most atmospheres and not susceptible to pin holing. Strong alkalis and weak alkaline solutions will attack the coating. Sheets will withstand moderate forming and bending without flaking or peeling. Can be welded satisfactorily by using the proper welding rod or flux.
SIZES—25 to 28 ga. up to 36 in. wide, and 190 in. long, or in coils; 14 to 24 ga. up to 38 in. wide and 194 in. long, or in coils.
MADE BY — *The American Rolling Mill Co., Middletown, Ohio.*

Gravity Ventilator

NAME—Asbo roof ventilator.
PURPOSE—For ventilating buildings.
FEATURES—Made of asbestos-protected metal sheets in 17 models for use on flat-roof, ridge-roof and slope-roof types, this new gravity ventilator is said to give maximum exhaust, freedom from downdraft, and complete weather protection. Frame structure designed to withstand wind velocity of 80 miles per hour.
SIZES AND CAPACITIES—For roof openings 15 x 15 in. to 125 x 125 in.
MADE BY—*American Steel Band Co., Felt-Cote Division, Pittsburgh, Pa.*

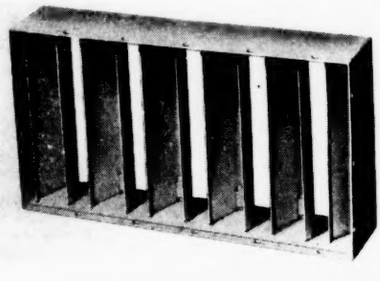


Quick Opening Couplings

NAME—Wiggins quick disconnect couplings.
PURPOSE—For quick dis-assembly of pipe lines carrying various liquids as well as compressed air and vacuum.
FEATURES—Connection is made by placing the two ends of the coupling together and raising a lever; the sections are disengaged by releasing a latch and lowering the lever, each operation requiring on'y a few seconds, according to the manufacturer. No bolts to tighten, no threads to match, and no special tools required. Couplings all made according to Federal Specifications.
SIZES—From 2 to 10 in. S.P.T.
MADE BY—*E. B. Wiggins Oil Tool Company, Inc., 3424 East Olympic Boulevard, Los Angeles, Calif.*

Adjustable Air Outlet

NAME—Volocitrol.
PURPOSE—To control the volume, pressure, and distribution of air across supply outlets.
FEATURES—Has a 16 ga. steel frame 2⅛ in. wide, with pivoted louvers of 24 ga. steel. Friction pins on each louver allow it to be set by hand, and positions are maintained when once set. A fireproofed felt edging strip to fit between the frame and the duct is furnished as standard.
LITERATURE AVAILABLE—Bulletin F-1916.
MADE BY—*Barber-Colman Company, Rockford, Ill.*



HOW FUEL OIL USERS CAN

Convert to Coal AND Save Money

with FREEMAN

COMMERCIAL AND INDUSTRIAL STOKERS

(COMPLETE RANGE OF SIZES: 75 TO 1200 POUNDS PER HOUR)

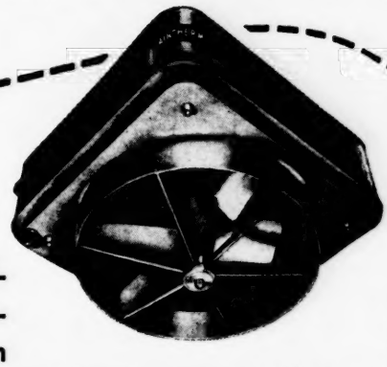
FREEMAN STOKER DIVISION, ILLINOIS IRON & BOLT CO.
GENERAL SALES OFFICES: 918 SOUTH MICHIGAN AVE., CHICAGO, ILL.

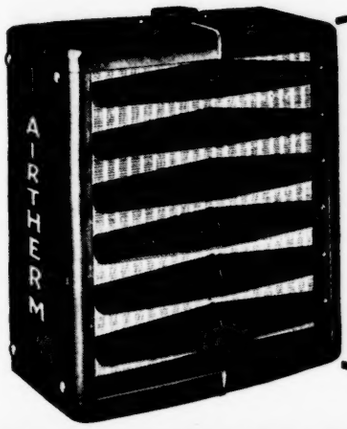
● **Most commercial and industrial oil burners must now be converted to coal!** You can make big money . . . and render vitally important service . . . by speeding this change-over with Freeman Stokers. Freeman is first choice of America's foremost heating engineers . . . has a time-proved record of dependability and long life . . . is manufactured by a pioneer leader in the stoker industry, rated AAA1, established 1864. Write immediately for details on your territory!

AIRTHERM

UNIT HEATERS

FOR VERTICAL DELIVERY





FOR HORIZONTAL DELIVERY

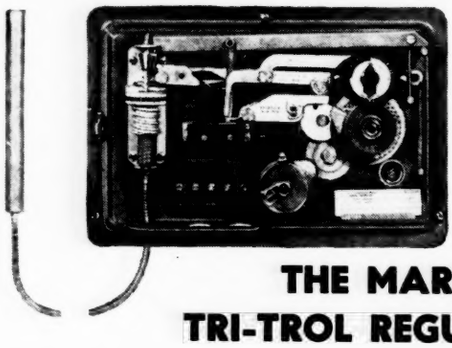
Extra-heavy tube-wall thickness of .065" for greater resistance to internal corrosion * Ingot iron tubes * Tubes and headers are welded and brazed into an integral unit guaranteed to withstand steam pressure up to 150 lbs. per sq. in. * Coils with lead alloy coating * Fins and tubes sealed by press-fit bond so that rust will not reduce the heat transfer.

AIRTHERM

MANUFACTURING COMPANY

722 S. SPRING AVE. • ST. LOUIS, MO.

SOMETHING YOU CAN SELL NOW
Saves Fuel for Uncle Sam
Earns Big Profits for You



THE MARSH
TRI-TROL REGULATOR

A complete and automatic heating system control for multiple-occupancy buildings. Controls heating the correct way — according to outside weather. Starts heating system at proper time in morning, maintains even temperature throughout the day, shuts off system at night.

Actual records show 15% to 20% fuel savings with the Marsh Tri-trol Regulator. Easily installed with present equipment. *Available right now without priorities.* Sales helps and mailing pieces are ready. To cash in on this timely money making and fuel saving campaign, *write today for all the facts.*

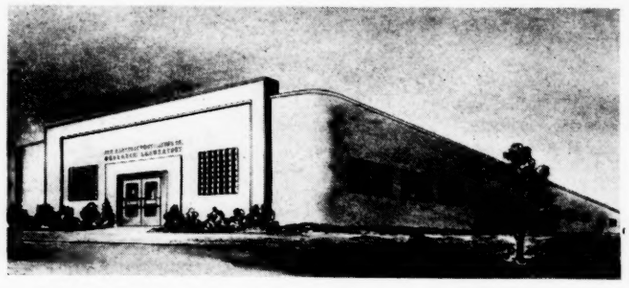
MARSH TRITROL COMPANY
400 South Michigan Avenue • Chicago, Illinois

THE JOHNSON
FAN & BLOWER CORPORATION
. . . takes pride in the fact that its FANS and BLOWERS have been chosen for so many war plant installations. Though virtually all our production capacity is being devoted to supplying primary war needs, we are endeavoring wherever possible to take care of essential private industries. Our manufacturing and engineering facilities and experience are gladly placed at the disposal of these industries, to help them solve their air-handling problems.
JOHNSON FAN & BLOWER CORPORATION
1321 West Lake St., Chicago, Ill.

WITH THE MANUFACTURERS

ILG ELECTRIC VENTILATING CO.

has planned a new research laboratory, remote from its present plant at 2850 North Crawford Ave., Chicago. The new building to be constructed immediately west of the present plant will be of one



story construction, and will be to a considerable extent soundproof. Equipment for the new building will include latest scientific instruments for measuring air, electricity, sound, light and vibration. Since the building is of vibration-proof construction, extremely sensitive apparatus is being installed for sound analysis. Stroboscopic equipment will be supplied for checking deflections while equipment is in operation. A separate heating plant will provide steam and hot water for testing steam and hot water unit heaters.

QUIMBY PUMP CO.

with plants at Newark and New Brunswick, N. J., has been purchased by H. K. Porter Co., Inc., Pittsburgh, Pa. The Quimby plants will be operated as a division of H. K. Porter Co., Inc., a manufacturer of industrial locomotives and chemical processing equipment. The purchase was made further to diversify the Porter line of products.

BROWN INSTRUMENT COMPANY

Philadelphia, a subsidiary of Minneapolis-Honeywell Regulator Company, has announced the appointment of George M. Muschamp and Paul L. Goldstrohm as vice-presidents. Mr. Muschamp will be in charge of engineering, and Mr. Goldstrohm in charge of production. Both posts are newly created.

YORK CORPORATION

is the new name of the York Ice Machinery Corporation, York, Pa. The change comes as a result of final court approval on a plan of merger and recapitalization.

PERSONALS AND PERSONNEL

R. H. SONNEBORN

will direct the sales of Chicago Nipple Mfg. Co., according to an announcement by J. Lester Williams, Jr., president.

AL H. WYNKOOP

newspaperman and after-dinner speaker, has resigned as city editor of the Lebanon (Ind.) *Daily Reporter,* a post he held for 20 years, to become public relations director of the U. S. Machine Corporation at Lebanon, manufacturers of Winkler stokers.

THE ALCO VALVE CO.

George E. Roepke

St. Louis, has announced the promotion of George E. Roepke from manager of sub-contracting to engineer in charge of refrigeration. For six years prior to the war Mr. Roepke was sales engineer in charge of the St. Louis district, from which he was recalled to handle sub-contracting work at the start of the war.

WALTER LIGE

has been appointed factory manager of the Bell & Gossett Company, manufacturers of water heaters and forced hot water heating systems. Mr. Lige was formerly in charge of the company's Pittsburgh office but will now make his headquarters at the home office and plant at Morton Grove, Ill.

D. D. WILE

has joined the engineering staff of Carrier Corporation. Mr. Wile has a broad background in engineering and manufacturing. After completing his engineering courses at the University of Kentucky, he joined American Radiator Company as research engineer. After several years he went with Detroit Lubricator Company where he held the position of chief engineer of the refrigeration and air conditioning division. From 1937 until 1941, Mr. Wile was chief engineer of the refrigeration division of the Savage Arms Company. For the past two years he has been general plant manager of the Kellogg Division of the American Brake Shoe and Foundry Company.

E. A. MOSBY

has been appointed sales manager of the Marsh Tritrol Company, 600 So. Michigan Avenue, Chicago. Mr. Mosby, who until recently was regional fuel oil ration officer of O.P.A., has had a number of years in sales and dealer relations as branch manager of General Motors Acceptance Corporation.

H. J. BARNSLEY

H. J. Barnsley

vice president of Jenkins Bros., manufacturers of valves, has been elected to the governing board of Jenkins Bros. Ltd., of Montreal, Canada, according to announcement today by Farnham Yardley, president.

Mr. Barnsley came to Jenkins Bros. 25 years ago from the Crane Company where he was chief drafting engineer. Previously he was connected with the American Graphophone Company, and the Locomobile Company. He is a member of the American Society of Mechanical Engineers, and the National Association of Power Engineers. Mr. Barnsley makes his headquarters at the company's New York City offices.

(Concluded on page 92)

It's Time to Tell About Refrigeration's "*Hidden Services*"

. . *take* Life-Saving

BLOOD PLASMA

for instance . . .

A leading physician of the American Medical Association, said recently, "Our vast program for procurement and distribution of Blood Plasma as a life saving measure for our armed forces is *dependent on REFRIGERATION.*"

Donated Blood would deteriorate and become useless, were it not for Cold Storage Cabinets at Blood Donor Centers, Refrigerated Shipping Containers which carry it—within 24 hours—to processing laboratories. Then Refrigerated Blood Coolers, Blood Banks, Plasma Storage cabinets protect the life-giving Plasma until processed for emergency use, at Army and Naval Hospitals, on shipboard and at Army field medical units overseas.

Because of this A-P record for DEPENDABILITY in Controls, leading engineers and designers of Refrigeration and Air Conditioning Equipment—for post-war markets —are already sending intricate new-control problems to A-P. We invite your inquiry, and assure you designing and engineering assistance that you can use to profit.

AUTOMATIC PRODUCTS COMPANY
2462 NORTH THIRTY — SECOND STREET
MILWAUKEE 10 WISCONSIN
Export Department . 100 Varick Street, New York City

ap DEPENDABLE *Refrigerant Valves*

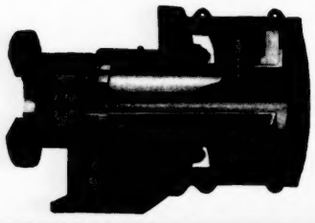
Do You Realize...

★ THAT 100' OF PIPE EXPANDS 5.1" DURING A TEMPERATURE CHANGE OF 0° TO 600°

★ THAT YOU CAN'T PREVENT IT..

★ THAT YOU MUST PROVIDE FOR IT

Unless proper provision is made for expansion caused by temperature changes, walls may be pushed out, pipes buckled — apparatus, pipes and fittings broken. With high pressure steam, this may not only be expensive but may stop production. There are ADSCO Joints for both high and low pressure — internally guided — internally-externally guided. Single or double joints with traverses up to 12" per slip. Flanged or beveled ends. With or without base, drip connections, service outlets. Write for Catalog 35HV.

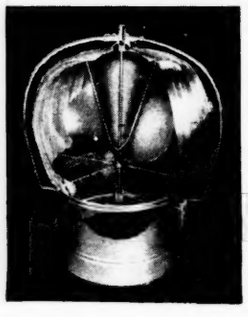


ADSCO Piston-Ring Joint—can be repacked under pressure.

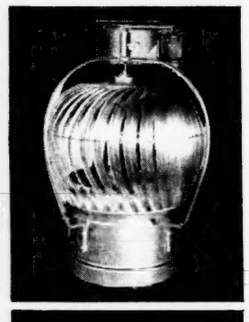
AMERICAN DISTRICT STEAM COMPANY NORTH TONAWANDA, N. Y.

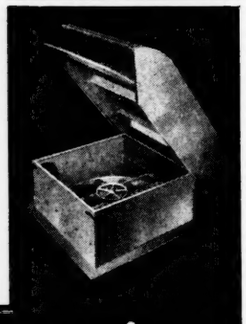
Making "UP-TO-DATE" Steam Line Equipment for over 60 years

Fresh Air Is SURE with "ALLEN'S"



A TYPE FOR EVERY NEED





Perfect ventilation is a war-production "must". Let Allen ventilation engineers report on your needs and recommend the most suitable type of equipment. Allen provides wide choice—famous self-operating Coni-Vane Turbines; Electro-Wind Coni-Vane with auxiliary power; Stationary types of various forms. Let ALLENS clear the atmosphere for maximum production!

Send today for fully descriptive and illustrated catalog. Wire or telephone if urgent. Representatives in most principal cities.

The ALLEN Corporation

9767 Erwin Ave. • Detroit, Michigan

(Concluded from page 91)

E. J. SNETSINGER

has been appointed general manager of Magnetrol, Inc., a newly organized division of the Fred H. Schaub Engineering Co., Inc., Chicago, manufacturers and designers of condensate return and boiler feed equipment.

T. M. CUNNINGHAM

has been designated general manager of construction and service of Carrier Corporation. G. D. Harbin has been designated regional construction manager of the central region to fill the vacancy created by the transfer of Mr. Cunningham.

GEORGE W. MARTIN

supervising engineer for the United States Realty and Improvement Company and its subsidiaries, New York, has resigned as of May 31. Mr. Martin, an alumnus of Stevens Institute of Technology, was chairman of the research committee, management division, Real Estate Board of New York. Mr. Martin plans to open an office in the fall as consulting engineer in the real estate field.

INDUSTRIAL DEGREE DAYS MAY, 1943

City	Number of Industrial Degree Days	
	55F Base	45F Base
Baltimore	4	0
Buffalo	158	26
Chicago	94	3
Cleveland	63	1
Detroit	71	2
Indianapolis	34	3
New York	27	1
Philadelphia	13	0
Pittsburgh	32	3
St. Louis	8	0

ARMY — NAVY

AWARDS

De Laval Steam Turbine Company, Trenton, N. J. (Second renewal)

Owens-Corning Fiberglas Corporation, Newark, N. J.

Builders Iron Foundry (Builders-Providence, Inc.), Providence, R. I.

H&V's PHOTOS

Page 35—U. S. Navy Official Photo.

COLLOIDAL FUEL

(Concluded from page 72)

ing not only makes rapid combustion, but also minimizes the possibility of ash deposits in furnaces or tubes, the ashes going out the stack in finely divided form.

Raw Material Sources

A large store of anthracite is available above ground and this could be used in the making of colloidal fuel. However, anthracite is high in ash content, ignites slowly, and power consumption, both for initial pulverization and the power required by the colloidal mill, is quite high. The cost of grinding increases rapidly with the degree of fineness attained and stabilization is more difficult than with bituminous coal which can be ground much more finely and which contains organic matter tending to dissolve or become wetted by the oil whereas anthracite coal is practically pure carbon.

Using No. 2 oil it is possible to extend the use of colloidal fuel to the domestic field and this would be especially desirable for use in boiler burner units designed for burning oil exclusively.

Coal hydrogenation, a process of coal liquefaction as accomplished in Europe for producing gasoline, oil, raw material for rubber, plastics, explosives, pharmaceutical and organic chemicals and dyes—all from coal — gives promise of early extension to these shores. In this event, we may eventually burn a colloidal fuel which is obtained 100% from coal (40% as obtained directly from finely ground coal and the balance of 60% from oil produced by coal liquefaction).

WASHINGTON NEWS

(Concluded from page 74)

gear, pumps, stokers, pulverizers and transformers.

"Sub-Components" are defined under the plan as crankshafts, fuel injectors, carburetors, magnetos, reduction gears, electric motors, electric motor controls and generators, or any of the "control components" when purchased by other than the prime contractor or the claimant agency.

The distinction between control components and sub-components is shown in the following examples:

Example 1—The prime contractor places an order with a boiler manufacturer to supply a power boiler, complete with stoker, forced draft fan, and feed water pump. The stoker, fan and pump will each be equipped with an electric motor and each electric motor will be equipped with electric motor controls. In this example the boiler is the control component. The stoker, fan and pump will be purchased by the boiler manufacturer from the manufacturer of these components, who will in turn purchase motors from the motor manufacturer, who in turn will purchase controls from the manufacturer of electric controls. The stoker, fan, pump, motors and controls are all sub-components.

Example 2—The prime contractor places an order with a stoker manufacturer to supply an automatic stoker complete with motor controls to feed a boiler which is already in place. In this example the stoker is the control component and the motor and the controls are sub-components.

To key all of the various manufacturers to the delivery schedule required of the prime contractor, General Scheduling Order M-293 gives authority to freeze delivery schedules so that priorities, directives and other procedures cannot disturb them.

NHA Scope Broadened

WPB Directive 24, effective June 18, delegates to the National Housing Agency authority to amend, with limitations, WPB approvals of materials and products to be used in war housing projects.

Keeping Constant Low Temperatures in Refrigerated Rooms by the NIAGARA "No Frost" Method... *Saves Compressor Capacity and Power*

PATENTED

● The NIAGARA "No Frost" System provides a more reliable method for obtaining...

1. *Extreme low temperatures in cold room.*
2. *Greater economy in refrigerating large spaces below freezing temperatures.*
3. *More dependable control of temperatures for better handling of perishable foods.*

NIAGARA "No Frost" System eliminates icing of cooler coils and shut-downs for de-icing. It gives increased capacity from compressors and increased refrigerated space from the same compressor equipment.

The NIAGARA "No Frost" Method has been thoroughly proven by practical experience for years of plant operation. Write for complete information and Niagara Bulletins 83 and 95. Address Department HV-7.

NIAGARA BLOWER COMPANY

General Sales Office: 6 E. 45th Street, New York City

37 W. Van Buren St., Chicago — Fourth & Cherry Bldg., Seattle

District Engineers in Principal Cities

NIAGARA INDUSTRIAL COOLING • HEATING • DRYING HUMIDIFYING • AIR ENGINEERING EQUIPMENT